

3.17 Emergency Management Plan

3.17.1 General

3.17.1.1 Consent requirements

[Condition XX]

3.17.1.2 Purpose

The purpose of this document is to provide a ready reference for management of emergencies at Redvale Landfill.

The operation of the Redvale Landfill might occasionally enter an emergency situation, in which a course of action must be taken urgently. This plan provides quick check list(s) and key contacts for each type of emergency. The objectives include protection of personnel and minimisation of damage to company facilities.

In addition to the above regulatory requirements, this plan is a requirement of the Hazardous Substances and New Organisms Act 1996 (HSNO), which is administered by the Environmental Protection Agency (EPA). The Dangerous Goods Act 1974 has now been incorporated into HSNO, and the control of packaging, handling and storage of dangerous goods previously undertaken by District Councils is now administered by ERMA and Health and Safety Work Act 2015 to provide a framework to ensure health and safety for all the works and workplace. Redvale Landfill has been audited and certified an EPA registered test certifier and is therefore fully compliant with the HSNO requirements.

3.17.2 Site information

3.17.2.1 Site contacts

Redvale Landfill Emergency Contact Details

Command Centre: Redvale Landfill, site reception. Dial 09 427 0600.

Glen Jujnovich, Regional Manager Redvale Landfill Dial 09 4270600 (Landfill) DDI [REDACTED] Dial [REDACTED] (Mobile)	Jim Jefferis, Technical Manager Dial 09 427 0600 (landfill) DDI [REDACTED] (office) Dial [REDACTED] (mobile telephone)
Matt Atkinson, Operations Manager (Redvale) Dial 09 427 0600 (landfill) DDI [REDACTED] (office) Dial [REDACTED] (mobile telephone)	Mike Rademeyer, Workshop Manager Dial 09 427 0600 (landfill) DDI [REDACTED] (office) Dial [REDACTED] (mobile telephone)
Cawood McCall Gas Generation Manager Dial 09 427 0600 (landfill) DDI [REDACTED] (office) Dial [REDACTED] (mobile telephone)	Johno Saunders, LFG Advisor Dial 09 427 0600 (landfill) DDI [REDACTED] (office) Dial [REDACTED] (mobile telephone)
Laiana Barbosa, Compliance Co-ordinator	Jenny Caicedo / Fei Ren, Sales Specialist Landfills

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Dial 09 427 0600 (landfill) Dial [REDACTED] (mobile telephone)	Dial 09 427 0600 (landfill) DDI [REDACTED] (office) Dial [REDACTED] (mobile telephone)
<u>Cameron Jamieson, HSEQ Advisor (E&R)</u> Dial 09 4270600 (Landfill) DDI [REDACTED] (office) Dial [REDACTED] (Mobile telephone)	
<u>External Services:</u>	
<u>Medical</u> Emergency = 111 Silverdale Medical Centre 09 427 9997 North Shore Hospital 09 486 8900	<u>WorkSafe New Zealand</u> General Enquiries 0800 030 040 Report an issue https://www.worksafe.govt.nz/notifications/report-an-unsafe-or-unhealthy-work-situation/
<u>Police</u> Emergency = 111 Non emergency = 105 Orewa Police Station 09 910 5105	<u>Fire Service</u> Emergency = 111 Hazardous Substance Advisor = 111 Non emergency Silverdale Fire Station 09 426 5032
<u>Auckland Council-Environment</u> Call Centre (General Enquiries) 09 301 0101 24/7 Pollution Hotline 09 377 3107	<u>National Radiation Laboratory</u> 03 366 5059 / 0800 367 222 or after hours duty pager [REDACTED]

3.17.2.2 Neighbours

A separate detailed contact list of Redvale Landfill's neighbours is available on request from site management. A copy of the neighbour contact details is kept with the Emergency Management Plan at 4 different locations of the site namely; site reception, flare site, workshop and landfill smoko room.

A plan showing the location of the landfill's neighbours is shown on Section 3.17 Appendix B.

3.17.2.3 Safety Data Sheet information

A database has been established at Redvale and located in the laboratory. The database is regularly updated by the Compliance Coordinator.

3.17.2.4 Site Emergency Equipment

Two emergency grab bags are available in the event of an emergency. The grab bags are located in the main reception area and the OHS coordinator at Redvale. Each Bag contains the following items:

- a. Copy of the Redvale EMP
- b. Copy of the Incident Management Guide
- c. List of Onsite Wardens and contact numbers
- d. Torch beacon
- e. Roll of emergency tape
- f. First Aid Kit

3.17.2.5 Radio procedure

1. Safety first. Stay calm.
2. Establish that no one is in immediate danger.

3. Get on the RT. State "This is an emergency situation – keep this channel clear".
4. Communicate clearly.
5. Ensure no one else over rides your call.
6. State what has happened and what is needed.
7. Give a description of the emergency – fire / flames / accident / vehicle fire / chemicals. Do not get downwind from fumes.
8. Wait for your call to be acknowledged.
9. Nominate a call coordinator.
10. Coordinate emergency. If necessary, call the Fire Service (judgement call).

3.17.3 Emergency Events

3.17.3.1 Fire – buildings and vegetation

Procedure for fires in buildings and vegetation:

1. Alert all staff on the site R.T. Sound the fire alarm.
2. Call the Fire Service, dial 1 for a line out, then dial 111.
3. If an automatic alarm sounds, call the Fire Service, then check for smoke and fire to ensure that there is no malfunction.
4. Call the Landfill Operations Supervisor via the R.T. or by phone.
5. Unlock gates required for access to the fire.
6. Use extinguishers to fight fire if there is no apparent danger to personnel. Use the water cart, but not on electrical and inflammable liquid fires.
7. As necessary, switch off power.
8. Fire-fighting reserve water can be quickly obtained from hydrants at the workshop, flare site and wheel wash, or from Ponds 1, 2, 3, 4 and 6.
9. If time and safety permits, shut doors and windows and close fire-proof cabinets and file drawers.
10. Evacuate personnel from the area. Evacuate on the side of caution.
11. Assemble at the emergency assembly point by the flag poles in front of the site office.
12. If site evacuation is necessary, account for all staff.
13. Call the Fire Service again (dial 1 for a line out, then dial 111) if a false alarm occurs.
14. All fires must be reported to the Auckland Council as soon as possible.

Locations of fire extinguishers:

- Site office reception (x1 CO2)
- Site office rear door (x1 Foam)
- Site office laboratory (x1 CO2)
- Site office door into laboratory (x1 Foam)
- Site office upstairs landing (x1 CO2, x1 Foam)
- Lunch room (smoko room)
- Weighbridge office
- Workshop
- Gas flare station
- Spotters hut on active tip face
- Perimeter fence odour suppression unit pump shed
- All WM vehicles and machines

Supplier of fire extinguishers:

Firewatch (Rodney South) 09 427 8985 or [REDACTED]

Fire Service Silverdale:

NZ Fire Service, Silverdale Fire Station 09 426 5032

3.17.3.2 Fire – Site office

1. Activate alarm.
2. Ensure a warden has taken over. If unable to locate warden, continue with warden duties.
3. If the alarm sounds, get out of the building. Assemble at the emergency assembly point by the flag poles outside the front of the site office.
4. Use extinguishers to fight fire if there is no apparent danger to personnel. Use the water cart, but not on electrical and inflammable liquid fires.
5. If time and safety permits, shut doors and windows, and close fire-proof cabinets and file draws.
6. Assemble by the flag poles in front of the main site office. Wait for instructions – do not leave the area.
7. All fires must be reported to the AC and the PRP.

3.17.3.3 Warden responsibilities

1. Contact warden from other areas of site.
2. Alert all staff on the site R.T. including the Landfill Operations Supervisor.
3. Call the fire service.
4. Call for the site water cart.
5. Grab the Emergency Grab Bag which will Emergency Management Plan and other emergency items as well as retrieving Visitor Book from reception.
6. Evacuate the site office building.
7. Check for smoke and fire to ensure that there is no malfunction.
8. Unlock gates – main entrance and exit gates.
9. As necessary, switch off power.
10. Fire-fighting reserve water can be quickly obtained from workshop hydrants, or Ponds 1, 2, 3, 4 and 6.
11. Account for all staff / visitors.
12. Close off discharge valves from ponds. (Done in the event of a fire on the landfill).
13. Fires on buildings discharge through the offsite channel. Organise material to block the offsite channel as no valves exist to stop discharges.

3.17.3.4 Locations of site office fire extinguishers:

- (a) Site office reception
- (b) Site office rear door.
- (c) Site office laboratory.
- (d) Site office door into laboratory.
- (e) Site office upstairs landing.

Elsewhere:

- (a) Lunch room (smoko room).
- (b) Weighbridge office.
- (c) Workshop.
- (d) Gas flare station.
- (e) Spotters hut on active tip face.
- (f) Perimeter fence odour suppression unit pump shed.
- (g) All WM vehicles and machines.

Location of site office illuminated emergency exits:

Entrance into Reception
Rear door
Side Door

Supplier of fire extinguishers:

Firewatch (Rodney South) 09 427 8985 or [REDACTED]

Fire Service Manukau:

NZ Fire Service, Silverdale Fire Station 09 426 5032

3.17.3.5 Fire – Vehicles

For fires in earthmoving machines and motor vehicles:

1. Stop the vehicle.
2. Grab the fire extinguisher.
3. Investigate the seat of the fire.
4. Avoid touching panels and hoods which may be hot.
5. Attempt to extinguish the fire.
6. Call the Landfill Operations Supervisor for assistance.
7. If extinguishing is unsuccessful, call the Fire Service, dial 1 for a line out, then dial 111.
8. If the situation is dangerous, call the Fire Service.
9. Make a clear access way for the Fire Service.
10. Keep a safe distance away from the machine if you can not isolate it.
 - Our bigger machines have been fitted with fire suppressant units
 - Make yourself familiar with the whereabouts of the fire extinguishers in the workshop
11. Report the incident to the AC and the PRP.

Auckland Pollution Hotline 24hrs Phone: 093773107

3.17.3.6 Fire – Landfill surface

1. If the fire appears too large to handle, call the fire service straight away.
2. Assume fumes are toxic. Stay out of the path of wind-blown smoke.
3. Put on protective gear if appropriate.
4. Identify the load or area on fire if possible. Warn others by site radio and call for assistance.
5. Use fire extinguishers if appropriate.
6. Also if necessary, use the water cart to spray water on the seat of the fire.
7. Also if necessary, spread daily cover soil over the burning area to smother the fire.
8. Use machines to push nearby loose, flammable rubbish etc out of the way if this can be done safely.
9. If these methods are unsuccessful, call for assistance from the Fire Service, dial 1 for a line out, then dial 111.
10. Exhume the burnt refuse in small sections.
11. Spray water on any fire which re-appears using the water cart, or if appropriate fire extinguishers. Fire-fighting reserve water can be quickly obtained from hydrants at the workshop, flare site and wheel wash, or from Ponds 1, 2, 3, 4 and 6.
12. Call for back-up fire extinguishers to be made ready.
13. Reconstruct the refuse cell to proper thickness with daily cover.

14. If a deeper landfill fire is apparent, design and implement a strategy to eliminate air entry to the refuse around the area of the fire which may include:
 - Foam cover (NZ Fire Service)
 - Isolate nearest gas extraction wells (WM)
 - Drill injection wells (Boart Longyear)
 - Check and seal leachate cleanout risers (WM)
 - Inject inert gas (BOC Gases)
15. Arrange for fire extinguishers to be refilled.
16. Report the incident to the AC and the PRP.

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3.17.3.7 Fire – Landfill subsurface

1. If the fire appears too large to handle, call the fire brigade straight away.
2. Assume fumes are toxic. Stay out of the path of wind-blown smoke.
3. Warn others by site radio and call for assistance.
4. Move vehicles away so that they don't fall into collapsing refuse
5. Put on protective gear as required.
6. Use machines to push nearby loose, flammable rubbish etc out of the way if this can be done safely.
7. Identify the load or area on fire if possible by visual inspection.
8. Monitor all surrounding gas wells for carbon monoxide and temperature.
9. Inspect the landfill surface and determine sources of air entry.
10. Use fire extinguishers and water on likely points of air entry.
11. Shut down the gas extraction system in wells showing elevated CO and temperature.
12. Reduce the vacuum in adjacent wells.
13. Call for back-up fire extinguishers to be made ready.
14. Wherever fire breaks out at the surface, spread cover soil and spray water to smother the fire using the water cart. Fire-fighting reserve water can be quickly obtained from hydrants at the workshop, flare site and wheel wash, or from Ponds 1, 2, 3, 4 and 6.
15. If these methods are unsuccessful, call for assistance from the Fire Service, dial 1 for a line out, then dial 111.
16. Design and implement a strategy to eliminate air entry to the refuse around the area of the fire which may include:
 - Foam cover (NZ Fire Service)
 - Isolate nearest gas extraction wells (WM)
 - Drill injection wells (Drillforce Ltd)
 - Check and seal leachate cleanout risers (WM)
 - Inject inert gas e.g. liquid CO₂ or N₂ (BOC Gases)\
17. Repair identified points of air entry.
18. Reconstruct the refuse cell to proper thickness with daily cover.
19. Arrange for fire extinguishers to be refilled.
20. Reintroduce gas extraction gradually over 3 days while monitoring the gas composition.
21. Report the incident to the AC and the PRP.

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3.17.3.8 Fire – Landfill gas from well, pipe or ground

1. If gas escaping from a well, a pipe or the ground is burning:
2. Turn off gas supply or crush burning pipe, only if it safe to do so.

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3. Turn off all nearby machines and motor vehicles. Turn off diesel machines.
4. Raise the alarm. Notify the Landfill Operations Supervisor.
5. Advise the gas team.
6. Call the Fire Service, dial 1 for a line out, then dial 111.
7. Clear the area of people.
8. Test air quality - gas team to use their own testing equipment.
9. Trained firemen are to enter the area only with full respiratory equipment to assess the cause.
10. Call the Police if neighbours could be affected. Evacuate down-wind if appropriate.
11. Perform repairs. Safety is paramount.
12. Do not enter the area. The Fire Service is to be in control.
13. Report the incident to the AC and the PRP.

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3.17.3.9 Medical accident

1. Identify the exact type of medical emergency (motor vehicle, fall, confined space, burn, etc)
2. Ensure that all personnel at the emergency site are safe.
3. For unconsciousness in a confined space, remember your own safety first; follow your confined space entry permit rescue procedure. For unconsciousness in any other area of the landfill, safety first, get back-up and test atmosphere/oxygen levels before entering for rescue. Phone emergency services if required.
4. Use safety harness and rope (stored in maintenance department container west of the workshop) to reach someone in an inaccessible place such as a quarry pit.
5. Administer First Aid and treatment as appropriate using a qualified first-aider.
6. Do not move the injured persons if there is a risk of greater harm e.g. spinal injury. Protect them at the scene.
7. Call an ambulance, dial 1 for a line out, then dial 111. Alternatively, make definite arrangements to take injured persons to a doctor (dial 1 for a line out, then dial 09 427 9997, Silverdale Medical Centre) or North Shore Hospital A &E Department (09 486 8900).
8. Call other emergency services (Fire Service, Police) as appropriate.
9. Notify the Landfill Operations Supervisor.
10. If there has been serious injury or death, call WorkSafe New Zealand (0800 030 040) by dialling 1 for an outside line, then 0800 209 020. Do not alter the accident scene without the permission of the inspector except to prevent further harm. Advise Health and Safety Manager and Regional Manager – Redvale Landfill.
11. If clearance has been given, clean up the accident site.
12. Prepare an incident report. This will be done by the most senior person on site +/- witness(es).
13. Fill in the accident register.

3.17.3.10 Medical – illness

1. Identify any obvious cause. Wear organic vapour masks if fumes are evident (available at the weighbridge). Look after your own safety first.
2. For unconsciousness in a confined space, get a back-up before entering.
3. Take the sick person to the sick bay (site office).
4. Assign a care-giver. Minimise the number of persons in attendance in case the illness is contagious.
5. Administer First Aid treatment.
6. Call an ambulance, dial 1 for a line out then dial 111, or take the sick person(s) to a doctor, dial 1 for a line out, then 09 427 9997 Silverdale Medical Centre, or take the sick person to North Shore Hospital A & E (09 486 8900) or arrange for the sick person to get home or to his/her doctor.
7. Notify the Landfill Operations Supervisor.

3.17.3.11 First Aid Kits

Location of First Aid kits

- Site office
- Lunch room (smoko room)
- Weighbridge office
- Workshop
- Gas flare station
- Spotters hut on active tip face
- All WM vehicles and machines

Checking of First Aid kits

Completed annually by company Health and Safety Officer

Supplier of First Aid kits

NZ Safety Blackwoods, Manukau City, 0800 660 660

3.17.3.12 Electric power failure

Sudden power failure:

1. Switch off all high power-consuming appliances (heaters) and all computers whose operation has not been sustained by a UPS (uninterruptible power supply). The only UPS on site is in the weighbridge office for the weighbridge computer, and this only lasts approximately 20 minutes.
2. Tow a 3 phase trailer-mounted diesel generator ('genset') to the rear of the site office. Activate the switches at the site office switchboard (located in the switch room, between the disabled toilet and uniform store room), following the instructions on the wall. A torch is located by the switchboard if required. Connect three phase power cable from the genset to the terminal on the outside of the rear of the site office and commence generation. Essential power will be delivered to:

Weighbridge office

Room 116 power points - GPS equipment store in engineers office

Room 119 power points - office

Room 120 power points - photocopier room

Room 125 power points - cupboard in photocopier room (file server, PABX)

Room 203 power points - upstairs accounts office and adjacent landfill engineer's office

3. Check that torches are available and working in each vehicle and building.
4. Notify power supply company of power failure (Mercury Energy 0800 201 820).
5. Once the weighbridge office UPS power for the weighbridge computer has been exhausted, manual docketing of waste loads will be necessary unless the "genset" has been connected, and is generating at the rear of the site office (see (2) above).

Voluntary power shut-down:

The power shut-off points are:

Site office:	switchboard in switch room
Lunch room (smoko room):	switchboard in lunch room (entrance to changing/locker area)
Weighbridge office:	switchboard in weighbridge office (by toilet door)

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Workshop: switchboard in workshop (rear of downstairs store room)

Gas Flare Station: see Gas Team Leader

Power to stormwater pumps: see Landfill Engineer

Power to gas flare:

The gas flare site has a stand-by diesel generator for use during power outages. Because of potential odour issues the gas flare will need to be restarted as soon as possible after the electrical power fails.

3.17.3.13 Flood

The main threat from flood is inundation of sedimentation ponds and the landfill.

Before an impending flood:

1. Move machines and diesel tanks to high ground.
2. Switch off the electric power to low-lying appliances.
3. Check all flowpaths including drains/open gates/ water tables and ponds. Lift the floating decants and secure any instruments at the ponds.

During and after flood conditions:

4. Check the diesel level in static generator at the flare site.
5. Inspect the landfill for instability and leachate leakage.
6. Isolate water which could be contaminated
7. Inspect the site for breaches of ponds and channels.
8. Make repairs (temporary if necessary) to ponds and channels.
9. Check the condition of road bridges and culverts.
10. Advise the weighbridge as soon as normal operations can resume.
11. Report the incident to the AC and the PRP.

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3.17.3.14 Earthquake

1. If inside a building, stay inside the building.
2. Take cover in an internal doorway or under a desk.
3. Stay away from windows and glass.
4. Do not use telephones.
5. Do not light a cigarette or fire.
6. If outside, move away from buildings, power lines, poles and trees.
7. Stop and park machines, trucks and vehicles for a minimum of 5 minutes. Repeat during aftershocks.
8. Afterwards, account for all personnel.
9. Administer First Aid wherever needed.
10. Refer to emergency procedure for sudden power failure if supply has failed (including turn off appliances and tow a genset to the site office).
11. Call the Landfill Operations Supervisor.
12. Identify the place and person to act as the Command Centre.
13. Do not admit any refuse hauliers to the landfill until clearance has been given by the Landfill Engineer.
14. Inspect the following for safety – access road, bridges, weighbridge office, site offices, power lines, gas flare station, flare stack, generators and workshop.

15. Measure for gas around buildings and the gas flare station. Use Redvale's meter or hire in equipment.
16. Inspect the following for environmental security – landfill slopes, leachate pipes, sedimentation ponds. There may be landslips/landslides or broken gas pipes.
17. Notify the Command Centre as each area is inspected and cleared. Walkover of the landfill and also inspection of the quarry.
18. Cease operations in any area where damage is found.
19. Take steps to prevent damage getting worse.
20. Prevent contaminant escape from any damaged area. Take urgent steps to mitigate any bad environmental effect.
21. Relocate the refuse operation where necessary and relocate refuse from damaged areas. Reinstate any damaged cover.
22. Repair any damage.
23. Report damage to the PRP and AC.
24. Continue operations when advised by the Command Centre.

3.17.3.15 Tornado and cyclone

1. Move into and stay inside buildings and/or heavy vehicles, to avoid wind-blown debris. Do not run outside.
2. Stay away from windows and glass.
3. Do not use telephones.
4. Do not light a cigarette or fire
5. Stop and park machines, trucks and vehicles.
6. Account for all personnel.
7. Administer First Aid wherever needed.
8. Refer to emergency procedure for sudden power outage if power supply has failed (including turn off appliances and tow a genset to the site office).
9. Call the Landfill Operations Supervisor.
10. Identify the place and person to act as the Command Centre.
11. Do not admit any refuse hauliers to the landfill until win speed has dropped.
12. Inspect the following for safety – buildings, power lines, litter fences and screens.
13. Continue operations when advised by the Command Centre.
14. Report damage to the PRP and AC.

3.17.3.16 Civil disturbance

In the event of a public protest:

1. Close and lock all gates.
2. Call the Police, dial 1 for a line out, then dial 111.
3. Notify the Landfill Operations Supervisor and the Regional Manager- Redvale Landfill.
4. Assign staff to man the gate to allow entry only to customers and authorised persons.
5. Move non-essential plant to lock-ups and safe places.
6. Patrol the fence and structures, ponds and monitoring installations near boundaries.
7. Stay inside building except for essential outside operations.
8. Evacuate the site if directed by the Landfill Operations Supervisor.

3.17.3.17 Strike/Lockout

1. Notify the Landfill Operations Supervisor and the Regional Manager- Redvale Landfill.
2. Set up a Command Centre to control operations during the strike.
3. Recall all employees not included in the strike or affected by the industrial action.

4. Establish a non strike staff pool to operate essential landfill operations and environmental monitoring during the strike.
5. Set up and train a temporary or standby labour pool.
6. Obtain task lists corresponding to the persons who have gone on strike and assign their tasks to non-strike staff.

3.17.3.18 Bomb threat

Person receiving the call:

1. Call the Police, dial 1 for a line out, then dial 111.
2. Fill in the Bomb Threat Information Sheet (see next page).
3. Call the Landfill Operations Supervisor, or transfer the call.
4. If you can not contact the Landfill Operations Supervisor, call the Weighbridge Attendant. This person shall then direct the following.

Landfill Operations Supervisor and Command Centre:

5. Identify the place and person to act as the Command Centre and to meet the Police.
6. Use site radio to advise all personnel on the site that there has been a bomb threat. Radios and communications must not be used near the indicated bomb site.
7. Close the main inwards gate to the landfill site.
8. Cordon the area specified by the bomb-caller.
9. Appoint a search team and define search areas.
10. Notify NZ Fire Service to be on standby.
11. Appoint site staff as standby fire fighters and First Aid attendants.
12. Notify the Command Centre as each area is searched and cleared.
13. Notify the Police via the Command Centre if anything suspicious is found.

All staff:

14. Stay in sheltered places. Do not go closer than 200 m to the indicated bomb site.
15. Perform tasks as set by the Command Centre (search, standby, traffic control).
16. If anything suspicious is found, report it immediately. Do not move, jar or touch the object or anything near it.
17. Leave doors and windows of buildings open.
18. Do not notify, visit or speak to representatives of the press, radio, television and other news media.

BOMB THREAT INFORMATION SHEET

Call taken:

Date: _____

Time: _____

Call taken by: _____

Position of person taking the call: _____

Police called (time): _____

Landfill Manager called (time): _____

Ask the caller:

When is the bomb set to explode? _____

Where is the bomb located? _____

What type of bomb is it? _____

What does the bomb look like? _____

What organisation does the caller represent? _____

Why was the bomb placed? _____

Transfer the caller to the Landfill Operations Supervisor.

Inform the caller that people could be injured or killed.

Caller informed (yes / no) _____

Caller details:

Time call received: _____

Time caller hung up: _____

Length of call: _____

Exact words of caller: _____

Male or female? _____

Young, middle-aged, old? _____

Voice pitch (high, normal, low)? _____

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Voice accent (local, foreign)? _____

Voice quality (rasping, nasal, speech defect, muffled)? _____

Voice sounded like (someone familiar)? _____

Background noise (machines, music, voices)? _____

DRAFT

3.17.3.19 Bomb discovery (includes explosives and ammunition)

This emergency procedure refers to any suspected explosive device, bomb, grenade or ammunition ordnance live or otherwise.

1. Do not disturb the device or discovered items. Assume it is live.
2. Do not use radio near the device or discovered material.
3. Move away. Cordon the area around the device. If necessary establish a new tip face at a suitable distance.
4. Notify the Landfill Operations Supervisor. Report all useful information which may be helpful in identification of the items, the source and haulier.
5. Call the Police if a bomb or appropriate. Dial 1 for a line out, then dial 111. or cell phone 111 send, at a suitable distance from the device and never less than 150 m away. They will notify the appropriate personnel.
6. Use site radio to notify all personnel on the site, to stay clear of the area.
7. Meet with the Police or Internal Affairs bomb disposal team.
8. Notify all personnel when clearance has been obtained.
9. Undertake appropriate investigation of the incident.

3.17.3.20 Explosion

Upon hearing an explosion in the vicinity:

1. Check for fire and follow fire procedures if there is a fire.
2. Evacuate personnel from the area around the explosion site.
3. Administer First Aid if necessary.
4. Call the Landfill Operations Supervisor. Identify the place and person to act as the Command Centre and to meet the Police.
5. Call the Police, dial 1 for a line out, then dial 111. If on tip face, call Police via mobile telephone or call the weighbridge office and ask the attendant on duty to call the Police.
6. If evacuation of the whole site is necessary, follow the evacuation procedure.
7. Use site radio to advise all personnel on the site.
8. Cordon the explosion area.
9. If appropriate, close the entrance gate.
10. Report damage to the PRP and AC.

3.17.3.21 Evacuation

1. In the case of a bomb threat, Refer to Part 3.15.2.16 BOMB THREAT of this Emergency Management Plan.
2. For rapid evacuation, go to step 12.
3. Place daily cover.
4. Lock vehicles, machines and plant which will remain on site.
5. Turn off all appliances and shut off the electric power (refer to electric power failure emergency action plan).
6. Shut off water at the tanks.
7. Lock fuel tanks.
8. Lock all gates except the gate which will be used to leave the site.
9. Close windows and lock buildings. Close and lock all lockable cabinets.
10. Hand keys to the Landfill Operations Supervisor or designated person before leaving (in the case of indefinite site abandonment only).
11. All staff to assemble in an orderly manner at the emergency assembly point by the flag poles outside the front of the site office, and leave the site together.
12. Account for all staff.

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13. Notify the Police and Fire Service why the site has been evacuated. Place a notice on the gate warning of any danger, giving the reason for site evacuation and providing a contact name and number.
14. Lock the gate on leaving, unless arrangements have been made to leave it open for a specific purpose such as for emergency services.
15. If it is necessary to evacuate neighbouring residents, refer to the "Neighbour List" and "Neighbour Map", a copy of which is kept with the emergency management plan at different locations of the site.

3.17.3.22 Hazardous waste discovery

Steps for Operators if a prohibited waste is identified at the landfill face:

1. Do not allow the material to be unloaded or further unloaded.
2. Isolate the suspected hazardous waste. Keep to one side. Do not mix with refuse.
3. Do not handle the waste.
4. Escort the transporter away from the landfill face to a safe place on site.
5. Notify the Landfill Operations Supervisor via radio or phone.
6. Give details of the generator and transporter to the Weighbridge Attendant who must fill in a Rejected Waste Report.
7. Identify the waste if possible. Determine the safest method to handle it. Use safe operating practices.
8. Form a secure area near the working face, with an earth bund if appropriate to contain hazardous waste.
9. Remove the waste to the secure area if appropriate to handle.
10. Cordon the secure area.

Steps for Management if a prohibited waste is identified at the landfill face:

1. Call for assistance from the Fire Service Hazardous Substance Advisor. Dial 1 for a line out, then dial 111 (Management will do this).
2. If there is any doubt whether the waste is infectious, immediately notify the Waitemata District Health Board (Management will do this). Maintain vehicle and walking access to the secure area for designated personnel.
3. Maintain vehicle and walking access to the secure area for designated personnel.
4. Conduct waste identification tests as necessary.
5. Notify the waste generator/transporter. Demand that they remove hazardous waste. If agreement is not reached immediately, dispose of the waste (refer to the hazardous waste removal guide included as Figure:3.15.4.1 of this Emergency Management Plan). Notify the waste generator/transporter that they will be charged for clean up and suspend their contract.
6. Check all documentation required by the disposal flow chart in the Waste Control Plan. Complete the Rejected Waste Report.
7. Notify the AC within one day of confirmation that the waste is hazardous.
8. Notify the PRP in a monthly report.

3.17.3.23 Landfill gas – detected in buildings / confined spaces

If gas is detected within buildings or confined spaces:

1. **Evacuate the building.** All occupants of the building are to evacuate via the nearest safe exit and assemble at the emergency assembly point by the flag poles in front of the site office.
2. **Raise the alarm.** Notify the Landfill Operations Supervisor.
3. **Advise the gas team,** unless it is them carrying out the gas monitoring.

4. **Isolate any source of flame or spark.** All flames and naked lights are to be extinguished. Do not operate electrical switches including power points and light switches. Do not use mobile telephones or all types of communication and electronic devices that have a battery.
5. **Ventilate the building.** Open as many doors and windows as possible in as short a time as possible.
6. **Call the Fire Service,** dial 1 for a line out, then dial 111.
7. Clear the area of people.
8. Test air quality – establish point(s) of ingress of the gas, but not inside the building.
9. Trained firemen are to enter the area only with full respiratory equipment to assess the cause.
10. Call the Police if neighbours could be affected. Evacuate down-wind if appropriate.
11. Perform repairs. Safety is paramount.
12. Reoccupation of building or confined space only after repairs performed and gas monitoring has proved that these are successful.
13. Report the incident to the AC and the PRP.

Auckland Pollution Hotline 24hrs Phone: 093773107

3.17.3.24 Landfill gas – escape from well or pipe

If gas is escaping from a well or pipe:

1. Turn off electrical appliances and welders. Isolate any source of spark.
2. Turn off all nearby machines and motor vehicles. Turn off diesel machines.
3. Raise the alarm. Notify the Landfill Operations Supervisor.
4. Advise the gas team.
5. Call the Fire Service, dial 1 for a line out, then dial 111.
6. Clear the area of people.
7. Test air quality - use the gas testing equipment kept at the flare station.
8. Trained firemen are to enter the area only with full respiratory equipment to assess the cause.
9. Call the Police if neighbours could be affected. Evacuate down-wind if appropriate.
10. Perform repairs. Safety is paramount.

Also, if the gas escaping from a well, pipe or ground is burning:

11. Refer to Part 3.15.2.7 FIRE – LANDFILL GAS FROM WELL, PIPE OR GROUND of this Emergency Management Plan.

3.17.3.25 Lightning strike

1. If out in the open during a lightning strike avoid standing near or under big trees. You will probably be a lot safer in a rubber tyred vehicle (but not a fuel cart).
2. Avoid metal objects (e.g. fences, litter screens, metal poles etc).
3. If tending an injured person hit by lightning, treat injured person as you would a burns/electric shock victim.
4. Call for assistance. Isolate area and ensure safety for yourself and injured person(s).
5. Report damage to the PRP and AC.

NOTE: There is currently lightning strike protection on the site office ('dynasphere' system) and at the flare site.

3.17.3.26 Asbestos exposure

1. Call for assistance and warn others of danger.
2. Ensure source of asbestos is no longer a danger, by wetting, burying or covering.

3. Whilst outside all buildings, remove any contaminated clothing. Place contaminated clothing in two sealed impermeable leak tight bags. Continue to wear respiratory equipment whilst this procedure is being carried out until such time as she / he is confident that there is no dust hazard.
4. Remove the respiratory equipment and carefully place the filters into plastic bags and seal.
5. Dispose of contaminated clothing and respiratory filters in the landfill following asbestos procedures (e.g. bury and cover).
6. Proceed to inside the building to shower and change into clean clothing.
7. Report asbestos exposure incident / accident to Landfill Operations Supervisor.
8. Complete appropriate paper work for incident / accident.
9. On advice of Landfill Operations Supervisor, go to Silverdale Medical Centre (details below) for a lung compression test, x-ray and general check-up within three months of incident / accident.
10. Report damage to the PRP and AC.

Silverdale Medical Centre
7 Polarity Rise
Silverdale 0932
Phone 09 427 9997

3.17.3.27 Landslide

1. **DURING A LANDSLIDE:** If inside a building, stay inside. Take cover under a desk, table or other pieces of sturdy furniture.
2. If outdoors, try and get out of the path of the landslide or mudflow.
 - Run to the nearest high ground in a direction away from the path.
 - If rocks and other debris are approaching, run for the nearest shelter such as a group of trees or a building.
 - If escape is not possible, curl into a tight ball and protect your head.
3. Use site radio and any other form of communication available to warn others in the vicinity.
4. **IMMEDIATELY AFTER A LANDSLIDE:** Stay away from the slide area. There may be danger of additional slides.
5. Check for injured and trapped persons near the slide area. Give First Aid if trained.
6. If safe to do so provide assistance to those who require it.
7. Obtain the latest emergency information (Civil Defence Emergency Management).
8. Remember that flooding may occur after a mudflow or a landslide.
9. Check for damaged power lines. Report any damage to the power company. Check the water supply and gas lines. Report any damage to management.
10. **AFTER A LANDSLIDE:** Check building foundations and surrounding land for damage.
11. Replant damaged ground as soon as possible since erosion caused by loss of ground cover can lead to flash flooding.
12. Seek the advice of a geotechnical expert for evaluating landslide hazards or designing corrective techniques to reduce landslide risk.
13. Report damage to the PRP and AC.

3.17.3.28 Fume exposure

1. Safety first. Wear an organic vapour mask in the affected area immediately after the hazard is identified.
2. Identify the waste type causing fume exposure.
3. Ensure that all personnel (staff and haulier) at the emergency site are safe and wearing appropriate PPE. Get other customer drivers out of the area - and yourself too.

Redvale Landfill Management Plan

4. Advise the Landfill Operations Supervisor of fume exposure incident and how many staff are affected.
5. Organise for a sample of the waste type to be taken by the special waste manager or environmental technician. Ensure that the sample is taken in a safe manner, with the waste sampler wearing appropriate PPE. Advise landfill operators that a sample is being taken.
6. Remove affected person(s) from area. Take person(s) to site First Aid room for assessment/rest in a fresh air environment.
7. Assign a caregiver to monitor affected person(s). Note down any symptoms shown by affected person(s) i.e. dizziness, disorientation, breathing difficulties, flushed face etc. Minimise the number of persons in attendance.
8. If the affected person(s) complain of stinging/sore eyes, flush eyes for up to 15 minutes. Use the sealed bottles of saline solution found in any of the site or vehicle First Aid kits.
9. If clothing smells of fumes, take affected person(s) to shower facilities. Put dirty clothing in plastic bags for laundering. Affected person(s) may require assistance in the shower if they are feeling disorientated or unstable on their feet. In the event that dirty clothing has been removed, clean clothing will be provided.
10. Sit quietly - get plenty of fresh air. Note any information for an incident report and accident report.
11. Call an ambulance, dial 1 for a line out, then dial 111, or take the affected person(s) to a doctor (dial 09 427 9997, Silverdale Medical Centre, 7 Polarity Rise, Silverdale) or take the affected person(s) to North Shore Hospital A&E or arrange for the affected person(s) to get home or to his/her doctor.
12. Notify the Landfill Operations Supervisor of outcome.
13. Complete the accident report.
14. Fill in the accident register.

3.17.3.29 Nuclear Density Meter Incident

In the event of an emergency involving the portable nuclear density meter (used for testing earth fill compaction), a Radiation Safety Plan is to be followed. The relevant references for this are:

- NRL code of safe practice NRLC15 2000
- NRL guidance notes NRLGN June 2000
- Radiation safety for NZ civil engineering industry March 2004

The relevant regulations related to the radiation safety are:

- The Radiation Protection Act 1965
- The Radiation Protection Regulations 1982

Storage:

Redvale Landfill owns a Nuclear Density Meter (NDM) for use in quality control soils testing of landfill liner compaction during the summer earthworks season. The NDM testing is carried out by geotechnical consultants and by trained WM staff. When not in use the NDM is stored in a locked cupboard located in the site laboratory, within the site office. Outside site hours the site office is locked and alarmed.

Radioactive sources within Nuclear Density Meter:

Cs137 (10 Ci)

Am241 (40 mCi)

NOTE : transport index = 0.2

Damage/theft/loss to Nuclear Density Meter on site:

1. If the NDM is dropped from a height >300mm, it is to be treated as an accident.
2. Advise all staff and visitors of incident involving the damage or potential damage to a Nuclear Density Meter in a building or on site.
3. Advise all staff and visitors to immediately evacuate to at least 3 metres away from the Nuclear Density Meter or the Nuclear Density Meter parts.
4. Secure the area within 3 meters of the Nuclear Density Meter so that no one will enter who is not authorised by the Radiation Licence holder or emergency services personnel.
5. Advise licence holder personally and immediately.
6. Advise emergency services that may be attending the incident of any damage or potential damage to the Nuclear Density Meter.
7. Physically advise the Landfill Operations Supervisor or Landfill Engineer of the nature of the incident (this must be done in person).
8. Secure damaged or potentially damaged NDM according to the instructions in the Guidance Notes. Carry out immediate wipe test if possible. Retract rod into 'SAFE' position if possible. Place damaged NDM/debris into plastic bag seal with adhesive tape and place a warning sticker on the package. If source rod is non-retractable make a note of where it is in the package. This to be done only by licensee or those trained in these accident procedures.
9. Follow the Radiation Safety Plan [RSP] (as required by the Radiation Safety Act [2016]; the RSP also references the Ministry of Health, Office of Radiation Safety, ORS C12 Code of Practice for Sealed Radioactive Material [2020]).
10. Notify the Landfill Operations Supervisor or Landfill Engineer of outcome.
11. Complete an accident report and fill in the accident register.
12. Advise commercial agent of the NDM (Geotechnics, 09-356-3510) and the training service provider (Civil Train, Stuart Moulding, 021 434202).
13. Notify the Auckland Council as soon as possible.

3.17.3.30 Biosecurity

Specific details as to the procedures for checking and unloading imported sea freight containers at Redvale Landfill are contained within the document "MPI Transitional Facility Operational Procedure Manual", which is revised annually. Overall responsibility for the transitional facility rests with the approved operator, and only an accredited person is authorised to carry out the container checking and unloading work.

More details are provided in Section 3.15 – Biosecurity of this LMP.

Emergency action:

Part of container inspected	Biosecurity contamination type	Action required
Exterior	Live	• Spray insecticide onto live contamination if possible • Call MAF Hotline immediately on 0800 809 966
	Dead	• All non-living contamination to be swept up and sweepings to be placed in quarantine bin • If concerned call MAF Hotline on 0800 809 966
Interior	Live	• Close the container doors • Spray insecticide around the container doors if there is a potential for escape • Advise all staff not to open container doors • Call MAF Hotline immediately on 0800 809 966

	Dead	• All non-living contamination to be swept up and sweepings to be placed in quarantine bin • If concerned call MAF Hotline on 0800 809 966
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3.17.3.31 Leachate – breakout from refuse pile / cover

Though the issues in relation to leachate breakouts are covered in different sections; 4.4 Stormwater Monitoring and Contingency Plan, 4.5 Groundwater, 4.6 Leachate Monitoring and Contingency Plan and 3.7 Landfill Gas Management Plan, these contingency steps are mentioned here for completeness of the site emergency management plan.

For leachate breakout from refuse pile:

1. Isolate the area concerned by forming temporary bunds.
2. Dig a sump in the nearby refuse. Form a channel to feed the leachate to this sump.
3. Close all valves in surface water treatment system downstream of the spill.
4. Check the conductivity of downstream waters including the surface water treatment ponds.
5. Excavate the refuse at the leak.
6. Take any refuse which contains an excessive proportion of soil to the active landfill face.
7. Repair the leakage zone by compacting relatively permeable refuse (low soil content) back into the excavation. This should improve vertical downwards percolation of leachate within the refuse.
8. Reinstall the cover.
9. If leachate migrates off the landfill footprint the Auckland Council must be notified as soon as possible.

3.17.4 Spill Response Plan

3.17.4.1 Spills

Spill Procedure

Standard spill response training is discussed at toolbox on a regular basis and follows the recommended steps of:

1. Be Safe
2. Stop the Source: turn off the pump; upright the container; plug the leak.
3. Protect Stormwater: confine the spill with earth/sand or other suitable material; block off access to the stormwater grates; plug the pond outlet.
4. Notify: tell your supervisor. He/she will contact the Landfill Manager who will notify the authorities as appropriate.
5. Clean Up: absorb or call in vacuum tanker.
6. Dispose of contaminant absorbent in landfill or contact WMTS Auckland to collect liquid waste. Leachate may be directed back into the leachate system.
7. Restock and Review: restock spill kit if required. Log incident in the Company's incident management system the Vault. Undertake an investigation and enter findings into the relevant section.

If the cause of the spill was from plant or equipment, lock-out the unit so it cannot be used again until fixed.

Smaller spills can be cleaned up using spill kit materials, rags or dirt.

Redvale Landfill Management Plan

Spill kits are available within the workshop and flare site areas. The contents of the spill kit are placed in a plastic pouch in the lid of the kit. All spill kits have associated signage. An example is provided in the photo below.

No special precautions are necessary i.e. specialised PPE is not required for handling any of the substances on site. However, if there is eye or skin contact with any chemical substances, standard first aid measures would apply. Contaminated clothing should be laundered prior to re-use.

Spill of over 20 litres, or any spill of Environmentally Hazardous Substances that has entered the stormwater system, a water-body or has contacted the unsealed ground, shall be reported to the Auckland Council's 24 Hour pollution Hotline (09-377-3107).

In the event of a major spill that enters receiving waters and caused significant environmental harm, Redvale would engage the services of an ecologist to investigate measures to restore affected habitat.

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3.17.4.2 Spill- Leachate

Sources of leachate spills

- The BeneVap Leachate Dosing Plant bunded area. The bund contains the BeneVap BV300 leachate evaporator, and three 26,000 litre leachate storage tanks. The evaporator and storage tanks are equipped with level monitoring, and the bund itself has the capacity to hold 76,000 litres. The bund is fitted with two level alarms, which are connected to the autodialer system which alerts the Technician on call. Prior to discharging collected rainwater, the water is tested and released if clean. Otherwise, it is transferred to the leachate tank for processing.
- The LEU evaporator bund area (as of 2026 not in use). This bund contains the LEU evaporator, a 30,000 litre leachate storage tank and a 15,000 litre residual sludge tank. The 15,000 litre tank is connected to the 30,000 litre tank. The latter tank has a high-level alarm.
- The bund itself has the capacity to hold 33,000 litres. It has also three, 5,000 litre sumps. The bund is fitted with two level alarms, which are connected to the autodialer system which alerts the Technician on call.
- Prior to discharging collected rainwater, the water is tested and released if clean. Otherwise, it is transferred to the leachate tank for processing.

For a leachate spill on-site from the BeneVap, LEU, a truck, hose or pipe:

1. Turn off leachate pump.
2. Shower any person who contacted the spilled leachate.
3. Use site radio to advise relevant personnel on the site (including the Landfill Engineer).
4. Form bunds to contain the leachate and prevent it from entering the stormwater system.
5. Close all valves in surface water treatment system downstream of the spill.
6. Measure the conductivity of downstream waters.
7. Assess the area extent of the spill.
8. Cover the spill area with loose soil to soak up the leachate.
9. Repair any leaks and prevent further spillage.
10. Pump surplus fluid leachate back into the landfill through an open landfill gas extraction well or the active refuse placement face. Use a sucker truck if necessary.
11. Evacuate contaminated soil and dispose of at the active landfill face. Use absorbent products or call a sucker truck to remove contaminated liquid and dispose either at the active tip face (leachate) or at a hazardous waste treatment plant.
12. Pump water over any remaining traces of spilled leachate to dilute them before reaching the stormwater system.
13. Close off mid pond valves and discharge point valves at the finger ponds. If possible close the valve of upstream source of water to prevent further discharge.
14. If the spill occurs from a tanker or truck directly into the stormwater system then go to the procedures regarding spill direct into surface water.
15. Report the incident to the AC and the PRP.

Auckland Pollution Hotline 24hrs Phone: 093773107

3.17.4.3 Spill - Landfill gas condensate

For a landfill gas condensate spill on-site from a truck, storage tank, hose or pipe:

1. Turn off the pump.
2. Shower any person who contacted the spilled condensate.
3. Use site radio to advise relevant personnel on the site (including the Landfill Engineer).
4. Form bunds to contain the condensate and prevent it from entering the stormwater system.
5. Close all valves in surface water treatment system downstream of the spill.
6. Measure the conductivity of downstream waters.
7. Assess the area extent of the spill.
8. Cover the spill area with loose soil to soak up the condensate.
9. Repair any leaks and prevent further spillage.
10. Pump surplus fluid condensate back into the landfill, or leachate treatment and storage pond. Into the landfill could be done through an open landfill gas extraction well or the active refuse placement face. Use a sucker truck if necessary.
11. Evacuate contaminated soil and dispose of at the landfill face. Use absorbent products and dispose at the active tip face or call a sucker truck to remove contaminated liquid for disposal at a hazardous waste treatment plant.
12. Pump water over any remaining traces of spilled condensate to dilute them before reaching the stormwater system.
13. If condensate migrates off the landfill footprint the Auckland Council must be notified as soon as possible. Also, report the incident to the PRP.
14. Close of mid pond valves and discharge point valves at the finger ponds. If possible, close the valve of upstream source of water to prevent further discharge.

Auckland Pollution Hotline 24hrs Phone: 09-377-3107

3.17.4.4 Spill - Fuel

1. Turn off the fuel source.
2. Turn off machines and any electrical devices. Extinguish cigarettes. Avoid ignition of the fuel.
3. Use site radio to notify the Landfill Operations Supervisor.
4. Administer First Aid to anyone harmed by the spill. Ensure safety first, which may involve the next few steps beforehand.
5. Form bunds to contain the spill. Stop the spill entering the stormwater system. Avoid contamination of water.
6. Close all valves in surface water treatment system downstream of the spill.
7. Cover the spilled fuel area with loose soil / dry mudstone / or sawdust from a spill absorbency wheelie bin to soak it up.
8. Make a mound out of the soil-fuel mixture with a stormwater drain around it.
9. Repair any leaks and prevent further spillage.
10. Excavate contaminated soil after it passes an ignition test. Weigh it at the weighbridge and after this load has been weighed in, dump it at the landfill face.
11. For spills occurring at storage tanks with a containment bund, excess fluid to be removed by a qualified contractor and sent for disposal off-site. Oil interceptors to be checked and cleaned out if required.
12. If spilt fuel migrates off the landfill footprint the Auckland Council must be notified as soon as possible. Also notify the incident to the PRP.

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13. Close of mid pond valves and discharge point valves at the nearest pond. If possible close the valve of upstream source of water to prevent further discharge
14. Deploy absorbent booms downstream of the spill to attenuate the flow of hydrocarbons off site.

Auckland Pollution Hotline 24hrs Phone: 09-377-3107

Location of fuel storage areas

- a. Main diesel storage tank: located at workshop, used to fill fuel truck. 5,000L capacity. Double skin steel tank, located on concrete slab, bunded and roofed. Tank and pipework has a HSNO SCL test certificate valid until 30 March 2023. Tank refilled by fuel supplier. When site not operating pneumatic fuel pump dispenser locked. The bund is constructed of painted steel and has a capacity of ~50,000 litres.
- b. Diesel Storage Tank (Workshop Area): 4000L capacity storage tank, which dispenses via the fuel pump and is replenished by mini tankers.
- c. Trailer tanker: 1,200L trailer tank that is towed onto site for refuelling of site vehicles (as required) and machine top-ups and is replenished by mini tankers. Double axle, rubber tyred. When site not operating locked by workshop.
- d. Energy Park Standby Generator: A 2,000 Litre diesel tank (HSNO certified) associated with the diesel generator.
- e. Site machinery i.e. diesel present in the machines.
- f. Delivery vehicles (therefore temporary storage):
 - vehicles delivering fuel to main diesel storage tank
 - vehicles delivering fuel to landfill construction contractors equipment or on-site establishment (during landfill liner construction season only)

Type of Spill Kits

- Sawdust within a lidded 240L MGB ('wheelie bin')
- Compressed bales

Location of Spill Kits – in pairs unless otherwise indicated

- Adjacent to main diesel storage tank (Type 1)
- Redvale Landfill workshop by workshop manager's office (Type 1)
- Redvale Landfill flare site (Type 1 and Type 2)
- Spare spill kits are kept in the store room on the first floor of the workshop (Type 2)

Supplier of fuel

Z Energy Limited, 0800 474 355

Supplier of Sawdust

Cypress Sawmills Ltd, Kaukapakapa 09 420 5485

Checking of spill kits

Completed annually by company Health and Safety Officer

Supplier of Industrial Spill Kits

Redvale Landfill Management Plan

NZ Safety Blackwoods, Manukau City, 0800 660 660

Excess fuel removal contractor

Waste Management Technical Services, Neales Road, 09 274 7963

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3.17.4.5 Spill - Oil

1. Turn off the oil source.
2. Turn off machines and any electrical devices. Extinguish cigarettes. Avoid ignition of the oil.
3. Use site radio to notify the Landfill Operations Supervisor.
4. Administer First Aid to anyone harmed by the spill. Ensure safety first, which may involve the next few steps beforehand.
5. If spill occurs outside bunded areas, form soil bunds to contain the spill. Stop the spill entering the stormwater system. Avoid contamination of water.
6. Close all valves in surface water treatment system downstream of the spill.
7. Cover the spilled oil area with loose soil / dry mudstone / or sawdust from a spill absorbency wheelie bin to soak it up.
8. Make a mound out of the soil-oil mixture with a stormwater drain around it.
9. Repair any leaks and prevent further spillage.
10. Excavate contaminated soil after it passes an ignition test. Weigh it at the weighbridge and after this load has been weighed in, dump it at the landfill face. For spills occurring within the fuel and services shed that incorporates a containment bund, excess fluid to be removed by a qualified contractor and sent for disposal off-site. Oil interceptors to be checked and cleaned out if required. If spilt oil migrates off the landfill footprint the Auckland Council must be notified as soon as possible.
11. Close of mid pond valves and discharge point valves at the nearest pond. If possible close the valve of upstream source of water to prevent further discharge.
12. Deploy absorbent booms downstream of the spill to attenuate the flow of hydrocarbons off site

Auckland Pollution Hotline 24hrs Phone: 09-377-3107

Location of oil storage areas

1. Fuel, engine and hydraulic oil: dangerous goods store adjacent to workshop for storage of drums, and 4 no. bulk tanks attached to workshop dispensers. Bulk tanks are single skin steel, volume as follows (in order from rear of store outwards):
 - 1370L Shell Tellus T46 hydraulic oil
 - 1000L Shell Rimula Super 15W-40 diesel engine transmission oil
 - 1000L Shell Rimula 10W diesel engine transmission oil
 - 1000L Spirax A 85W-140 gear oilDangerous goods store has got concrete walls and floor and incorporates a containment bund . The roof structure is of timber. The doors are rated to hold a fire within the room for 120 minutes. Drums and bulk tank contents replaced by oil supplier.
2. Workshop used oil tank: used oil storage tank for workshop 4,000L capacity. Single skin steel, located on concrete slab with containment bund and doesn't have roof. Tank emptied by waste oil recycling contractor. The bund is constructed of concrete blocks and has a capacity of ~3,000 litres. Liquid collected in this bund drains via a pipe into the pipework channel associated with the diesel tank. This channel discharges via the three stage interceptor connected to the truck wash chamber. The bund is usually drained when there is about 10cm of water in its base. Before the valve is opened, the water is visually checked for clarity. If it is clear or there is a rainbow sheen on the surface, it will be discharged to the interceptor.

Redvale Landfill Management Plan

If contamination exceeds a minor sheen on the water's surface, WMTS will be asked to remove the liquid during their weekly visit. The cause of the contamination will be logged as an incident and investigated.

3. LFG generator new lubricating oil: flare site oil storage tank 30,000L capacity. Single skin steel tank, located on concrete slab with containment bund. Tank refilled by oil supplier. Located on concrete slab with oil interceptor for slab drainage. Refilling vehicles use concrete slab unloading area that has drainage linked to oil interceptor.
4. LFG generator used lubricating oil: flare site oil storage tank 10,000L capacity. Single skin steel tank, located on concrete slab with containment bund. Tank emptied by waste oil recycling contractor. Located on concrete slab with oil interceptor for slab drainage. Filling vehicles use concrete slab unloading area that has drainage linked to oil interceptor.

Both of the tanks; with new lubricating oil and used lubricating oil, have a single containment bund, with capacity of over 84,000 litres. The bund and concrete pad have a stormwater collection sump with an associated shut-off valve. The sumps drain to a three stage interceptor and from there, into Pond 1 system. The capacity of the sumps is ~200 litres.

Rainwater collected within the bund will be discharged via the interceptor if there is no oily sheen on the water's surface. The shut-off valves are not fully opened during discharge so the flow is measured.

If the quality of the water is not acceptable, it is pumped and processed through the evaporator.

Rainwater collected in the unloading pad's sump is removed prior to transfer of oil from the pad to the tank.

5. Delivery vehicles (therefore temporary storage):
 - vehicles delivering new oil in drums to dangerous goods store
 - vehicles delivering bulk new oil to flare site storage tank
 - vehicles removing used oil from workshop used oil tank
 - vehicles removing bulk used oil from flare site storage tank
 - vehicles carrying new and used oil in drums for WM site plant maintenance contractor (contractor = Terra Cat, agents for Caterpillar)
 - vehicles carrying new and used oil in drums for landfill construction contractor (during landfill liner construction season only)

Location of oil interceptors

Flare site oil storage area, north-east corner of concrete slab and containment bund

End of concrete slab west of workshop (2 no.)

South-east of flare site building (1 no.)

Type of Spill Kits

- a. Sawdust within a lidded 240L MGB ('wheelie bin')
- b. Compressed bales

Location of Spill Kits – in pairs unless otherwise indicated

Adjacent to main diesel storage tank (Type 1)

Redvale Landfill workshop by workshop manager's office (Type 1)

Redvale Landfill flare site (Type 1 and Type 2)

Spare spill kits are kept in the storeroom on the first floor of the workshop (Type 2)

Supplier of oil

Z Energy Limited, 0800 474 355

Supplier of Sawdust

Cypress Sawmills Ltd, Kaukapakapa 09 420 5485

Supplier of Industrial Spill Kits

NZ Safety Blackwoods, Manukau City, 0800 660 660

Checking of spill kits

Completed annually by company Health and Safety Officer

Excess oil removal contractor

Waste Management Technical Services, Neales Road, 09 274 7963

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3.17.4.6 Spill – Motor fluids e.g. coolants

1. Turn off the oil source.
2. Turn off machines and any electrical devices. Extinguish cigarettes. Avoid ignition of the oil.
3. Use site radio to notify the Landfill Operations Supervisor.
4. Administer First Aid to anyone harmed by the spill. Ensure safety first, which may involve the next few steps beforehand.
5. If spill occurs outside bunded areas, form soil bunds to contain the spill. Stop the spill entering the stormwater system. Avoid contamination of water.
6. Close all valves in surface water treatment system downstream of the spill.
7. Cover the spilled oil area with loose soil / dry mudstone / or sawdust from a spill absorbency wheelie bin to soak it up.
8. Make a mound out of the soil-oil mixture with a stormwater drain around it.
9. Repair any leaks and prevent further spillage
10. Excavate contaminated soil after it passes an ignition test. Weigh it at the weighbridge and after this load has been weighed in, dump it at the landfill face.
11. For spills occurring within the fuel and services shed that incorporates a containment bund, excess fluid to be removed by a qualified contractor and sent for disposal off-site. Oil interceptors to be checked and cleaned out if required. If spilt oil migrates off the landfill footprint the Auckland Council must be notified as soon as possible.
12. Close of mid pond valves and discharge point valves at the nearest pond. If possible close the valve of upstream source of water to prevent further discharge
13. Deploy absorbent booms downstream of the spill to attenuate the flow of hydrocarbons off site

Auckland Pollution Hotline 24hrs Phone: 09-377-3107

Location of motor fluid storage areas

1. Site plant motor fluids: dangerous goods store adjacent to workshop for storage of drums, and bulk 700L plastic container of vehicle coolant – concrete construction, incorporates containment bund. Drum and bulk vehicle coolant container contents replaced by motor fluid supplier. Coolant is pre-mixed, so no dilution is required.
2. LFG generator coolant: pre-mixed by flare site staff in containers of various sizes, 1 located by each generator. Pre-mixed coolant by generators to be stored on a spill capture device. Drums of neat coolant replaced by motor fluid supplier. Drums of neat coolant to be stored in dangerous goods store adjacent to workshop (concrete construction, incorporates containment bund).
3. Delivery vehicles (therefore temporary storage):
 - vehicles delivering new motor fluids and removing used motor fluids in drums and bulk at the dangerous goods store
 - vehicles carrying new and used motor fluids in drums for WM site plant maintenance contractor (contractor = Terra Cat, agents for Caterpillar)
 - vehicles carrying new and used motor fluids in drums for landfill construction contractor (during landfill liner construction season only)

Location of oil interceptors

- Flare site oil storage area, north-east corner of concrete slab and containment bund
- End of concrete slab west of workshop (2 no.)
- South-east of flare site building (1 no.)

Type of spill kits

Redvale Landfill Management Plan

- a. Sawdust within a lidded 240L MGB ('wheelie bin')
- b. Compressed bales

Location of spill kits – in pairs unless otherwise indicated

- Adjacent to main diesel storage tank (Type 1)
- Redvale Landfill workshop by workshop manager's office (Type 1)
- Redvale Landfill flare site (Type 1 and Type 2)
- Spare spill kits are kept in the store room on the first floor of the workshop (Type 2)

Supplier of motor fluids

Z Energy Limited, 0800 474 355

Supplier of sawdust

Cypress Sawmills Ltd, Kaukapakapa 09 420 5485

Supplier of industrial spill kits

NZ Safety Blackwoods, Manukau City, 0800 660 660

Checking of spill kits

Completed annually by company Health and Safety Officer

Excess fluid removal contractor

Waste Management Technical Services, Neales Road, 09 274 7963

3.17.4.7 Spill – Deodoriser

1. Turn off the source including deodoriser pump, deodoriser tank, deodoriser storage drums and valves on water storage tank.
2. Shower any person who contacted the spilled deodoriser.
3. Use site radio to notify the Landfill Operations Supervisor.
4. Form bunds to contain the spill. Stop the spill entering the stormwater system. Avoid contamination of water.
5. Close all valves in surface water treatment system downstream of the spill.
6. Measure the conductivity of downstream waters. Cover the spilled fluid area with loose soil / dry mudstone / or sawdust from a spill absorbency wheelie bin to soak it up.
7. Make a mound out of the soil-fluid mixture with a stormwater drain around it.
8. Repair any leaks and prevent further spillage.
9. Excavate contaminated soil. Weigh it at the weighbridge and after this load has been weighed in, dump it at the active landfill face.
10. Pump water over any remaining traces of spilled fluid to dilute them before reaching the stormwater system.
11. For spills occurring within the dangerous goods store that incorporates a containment bund, excess fluid to be removed by a qualified contractor and sent for disposal off-site. Oil interceptors to be checked and cleaned out if required.
12. If spilt deodoriser migrates off the landfill footprint the Auckland Council must be notified as soon as possible.
13. Close of mid pond valves and discharge point valves at the nearest pond. If possible close the valve of upstream source of water to prevent further discharge
14. Deploy pumps downstream of the spill.

Auckland Pollution Hotline 24hrs Phone: 09-377-3107

Location of deodoriser storage areas

1. Dangerous goods store: dangerous goods store adjacent to workshop for storage of drums – concrete construction, incorporates containment bund. Deodoriser is delivered in 1,000L IBC containers by deodoriser supplier. Deodoriser partly diluted by WM staff adding it to water in fixed ratio (30L deodoriser per 1000L water) within a square 1000L plastic storage tank. Partially diluted product is then decanted onto 20L plastic containers and fully diluted in a fixed ratio at the mobile odour suppression unit storage tank.
2. Mobile odour suppression unit storage tank: partly diluted deodoriser is fully diluted with water in a wheeled stainless steel 9000L storage tank in a fixed ratio. Mobile application units (T-bar sprayers) are located close to the active tip face.
3. Mobile odour suppression unit – Fog cannon associated containers (20L): Odour neutraliser plus (SCD 1100), injected in the spray line.
4. Perimeter fence odour suppression unit: comprises pump shed (food grade stainless steel lined shipping container), partly diluted deodoriser storage tank (1000L) and water storage tank (22,500L). Neat deodoriser is automatically added to water from the neat deodoriser drum in a fixed ratio, in 2 stages:
 - neat deodoriser in 200L HDPE drum (stored in pump shed) → 1000L plastic storage tank (outside, on trailer)
 - partially diluted product is automatically fully diluted with water from 22500L water storage tank and sprayed into dispersion nozzles located on the northern perimeter litter fence.Spare drums of deodoriser are stored in the dangerous goods store adjacent to the workshop – concrete construction, incorporates containment bund. At this location deodoriser is delivered neat in 200L HDPE drums, and drums are replaced by the deodoriser supplier.

Redvale Landfill Management Plan

When site not operating the pump shed is locked and the deodoriser pump turned off.

Type of spill kits

- a. Sawdust within a lidded 240L MGB ('wheelie bin')
- b. Compressed bales

Location of spill kits – in pairs unless otherwise indicated

- Adjacent to main diesel storage tank (Type 1)
- Redvale Landfill workshop by workshop manager's office (Type 1)
- Redvale Landfill flare site (Type 1 and Type 2)
- Spare spill kits are kept in the store room on the first floor of the workshop (Type 2)

Supplier of deodoriser

Biox International Limited, Mt Manganui, 09 4 155 460

Supplier of sawdust

Cypress Sawmills Ltd, Kaukapakapa 09 420 5485

Supplier of industrial spill kits

NZ Safety Blackwoods, Manukau City, 0800 660 660

Checking of spill kits

Completed annually by company Health and Safety Officer

Excess fluid removal contractor

Waste Management Technical Services, Neales Road, 09 274 7963

3.17.4.8 Spill – Fertiliser

1. Close any relevant valve, shutter or barrier to stop the flow.
2. Shower any person who contacted the spilled fertiliser.
3. Use site radio to notify the Landfill Operations Supervisor.
4. Form bunds to contain the spill – note that fertiliser is applied dry, not as liquid. Stop the spill entering the stormwater system. Avoid contamination of water.
5. Close all valves in surface water treatment system downstream of the spill.
6. Measure the conductivity of downstream waters. Cover the spill area with loose soil / dry mudstone / or sawdust from a spill absorbency wheelie bin to prevent migration.
7. Make a mound out of the soil-fertiliser mixture with a stormwater drain around it.
8. Repair any leaks and prevent further spillage.
9. Excavate contaminated soil. Weigh it at the weighbridge and after this load has been weighed in, dump it at the active landfill face.
10. Pump water over any remaining traces of spilled fertiliser to dilute them before reaching the stormwater system.
11. Close of mid pond valves and discharge point valves at the nearest pond. If possible close the valve of upstream source of water to prevent further discharge .
12. Deploy pumps downstream of the spill

Auckland Pollution Hotline 24hrs Phone: 093773107

Location of fertiliser storage areas

- Implement storage shed: all fertiliser is stored in the implement storage shed adjacent to the dangerous goods store. Fertiliser is delivered dry within 25kg sacks in bulk on pallets by the fertiliser supplier.
- Tractor spreading: applicator attaches to rear of tractor for dry fertiliser spreading. When site is not operating tractor applicator is stored in the implement storage shed adjacent to the dangerous goods store.

Type of spill kits

- a. Sawdust within a lidded 240L MGB ('wheelie bin')
- b. Compressed bales

Location of spill kits – in pairs unless otherwise indicated

- Adjacent to main diesel storage tank (Type 1)
- Redvale Landfill workshop by workshop manager's office (Type 1)
- Redvale Landfill flare site (Type 1 and Type 2)
- Spare spill kits are kept in the store room on the first floor of the workshop (Type 2)

Supplier of fertiliser

Falloons, Dairy Flat 09 426 4402

Supplier of sawdust

Cypress Sawmills Ltd, Kaukapakapa 09 420 5485

Supplier of industrial spill kits

NZ Safety Blackwoods, Manukau City, 0800 660 660

Checking of spill kits

Completed annually by company Health and Safety Officer

3.17.4.9 Spill – Cleaning agent (degreasing fluid)

1. Turn off the source.
2. Turn off machines and any electrical devices. Extinguish cigarettes. Avoid ignition of the fluid.
3. Use site radio to notify the Landfill Operations Supervisor.
4. If spill occurs outside bunded areas, form soil bunds to contain the spill. Stop the spill entering the stormwater system. Avoid contamination of water.
5. Close all valves in surface water treatment system downstream of the spill.
6. Cover the spilled fluid area with loose soil / dry mudstone / or sawdust from a spill absorbency wheelie bin to soak it up.
7. Make a mound out of the soil-fluid mixture with a stormwater drain around it.
8. Repair any leaks and prevent further spillage.
9. Excavate contaminated soil after it passes an ignition test. Weigh it at the weighbridge and after this load has been weighed in, dump it at the active landfill face.
10. For spills occurring within the dangerous goods store that incorporates a containment bund, excess fluid to be removed by a qualified contractor and sent for disposal off-site. Oil interceptors to be checked and cleaned out if required.
11. If spilt motor fluids migrate off the landfill footprint the Auckland Council must be notified as soon as possible.
12. Close of mid pond valves and discharge point valves at the nearest pond. If possible close the valve of upstream source of water to prevent further discharge.
13. Deploy pumps downstream of the spill

Auckland Pollution Hotline 24hrs Phone: 09-377-3107

Location of cleaning agent storage areas

- Dangerous goods store: dangerous goods store adjacent to workshop for storage of drums – concrete construction, incorporates containment bund. Drums replaced by cleaning agent supplier.
- Parts washing bath: degreasing fluid used to fill stainless steel parts washing bath located on the south side of the workshop.
- Delivery vehicles (therefore temporary storage): vehicles delivering new cleaning agent and removing used cleaning agent in drums at the dangerous goods store.

Redvale Landfill Management Plan

Location of oil interceptors

- Flare site oil storage area, north-east corner of concrete slab and containment bund
- End of concrete slab west of workshop (2 no.)

Type of spill kits

- a. Sawdust within a lidded 240L MGB ('wheelie bin')
- b. Compressed bales

Location of spill kits – in pairs unless otherwise indicated

- Adjacent to main diesel storage tank (Type 1)
- Redvale Landfill workshop by workshop manager's office (Type 1)
- Redvale Landfill flare site (Type 1 and Type 2)
- Spare spill kits are kept in the store room on the first floor of the workshop (Type 2)

Supplier of cleaning agent

Z Energy Limited, 0800 474 355

Supplier of sawdust

Cypress Sawmills Ltd, Kaukapakapa 09 420 5485

Supplier of industrial spill kits

NZ Safety Blackwoods, Manukau City, 0800 660 660

Checking of spill kits

Completed annually by company Health and Safety Officer

Excess fluid removal contractor

Waste Management Technical Services, Neales Road, 09 274 7963

3.17.4.10 Spill – Cleaning agents (other)

Other than degreasing fluid, cleaning agents are not used at Redvale Landfill in bulk quantities, and are only used in small amounts within site buildings for hand washing, dish washing and the cleaning of bench tops, floors, toilets and equipment. Accordingly any spillage of these products is likely to be very small and localised within a site building, and therefore the associated environmental risk is minimal. Because of the low consumption of these products, only small quantities are stored on site.

Auckland Pollution Hotline 24hrs Phone: 093773107

Location of cleaning agents

- Site office: Cupboard under kitchen sink, pantry in kitchen, cleaner's cupboard by rear door and laboratory. When site is not operating the site office is locked and alarmed.
- Site laboratory (within site office): Harmful substances cupboard under sink by fume cupboard. When site is not operating the site office is locked and alarmed.
- Lunch room (smoko room): Cupboard under kitchen sink. When site is not operating the lunch room is locked and alarmed.

Supplier of cleaning agents

Site office

PZ Cussons (New Zealand) Pty Ltd., 0800 316 131

Reckitt Benckiser, 0800 403 030

SC Johnson & Son Pty Ltd., 0800 803 615

Site laboratory (within site office)

Kiwicare Corporation Ltd., 03 389 0778

CRC Industries (NZ) Ltd., 09 272 2700

Andrew Brands Ltd., 0800 802 626

Reckitt Benckiser, 0800 764 766

Paramount Pools & Spas, 09 415 3656

Lunch room (smoko room)

Reckitt Benckiser, 0800 403 030

SC Johnson & Son Pty Ltd., 0800 656 534

3.17.4.11 Spill – Sewage

1. Turn off the source.
2. Shower any person who contacted the spilled sewage.
3. Use site radio to notify the Landfill Operations Supervisor.
4. Form bunds to contain the spill. Stop the spill entering the stormwater system. Avoid contamination of water.
5. Close all valves in surface water treatment system downstream of the spill.
6. Measure the conductivity of downstream waters. Cover the spill area with loose soil / dry mudstone / or sawdust from a spill absorbency wheelie bin to prevent migration.
7. Make a mound out of the soil-sewage mixture with a stormwater drain around it.
8. Repair any leaks and prevent further spillage.
9. Excavate contaminated soil. Weigh it at the weighbridge and after this load has been weighed in, dump it at the landfill face. Use absorbent products or call a sucker truck to remove contaminated liquid and dispose either at the active tip face (small amounts) or at a hazardous waste treatment plant.
10. Pump water over any remaining traces of spilled sewage to dilute them before reaching the stormwater system.
11. If spilt sewage migrates off the landfill footprint the Auckland Council must be notified as soon as possible. Also, report the incident to the PRP.

Note: Waste Tank from Lunchroom and Workshop will flow to the onsite channel
Waste Tank from Main Office and Weighbridge will flow to the offsite channel

Auckland Pollution Hotline 24hrs Phone: 09-377-3107

Location of sewage storage areas

- Site office septic tank: the landfill office has a septic tank, located east of the building. This septic tank has a high level alarm in the site office, and is regularly emptied by a sewage disposal contractor. The septic tank is emptied via a manhole lid located in a garden area by the eastern car park.
- Lunch room (smoko room) septic tank: the lunch room has a septic tank, located north-west of the building. This septic tank has a high level alarm in the lunch room, and is regularly emptied by a sewage disposal contractor. The septic tank is emptied via a manhole lid located in a grassed area by the lunch room car park.
- Workshop septic tank: the workshop has a septic tank, located south-east of the building. This septic tank has a high level alarm in the workshop, and is regularly emptied by a sewage disposal contractor. The septic tank is emptied via a manhole lid located in a concreted area in front of the dangerous goods store main doors.
- Flare site office septic tank: the flare site office has a septic tank, located north-east of the building. This septic tank is regularly emptied by a sewage disposal contractor. The septic tank is emptied via a manhole lid located in an embankment between the flare site fence and the 'crossroads'.
- Weighbridge office septic tank: the weighbridge office has a septic tank, located west of the building. This septic tank has a high level alarm in the weighbridge office, and is regularly emptied by a sewage disposal contractor. The septic tank is emptied via a manhole lid located in a garden area in front of the weighbridge office front door.

Redvale Landfill Management Plan

Type of spill kits

- a. Sawdust within a lidded 240L MGB ('wheelie bin')
- b. Compressed bales

Location of spill kits – in pairs unless otherwise indicated

- Adjacent to main diesel storage tank (Type 1)
- Redvale Landfill workshop by workshop manager's office (Type 1)
- Redvale Landfill flare site (Type 1 and Type 2)
- Spare spill kits are kept in the store room on the first floor of the workshop (Type 2)

Supplier of sawdust

Cypress Sawmills Ltd, Kaukapakapa 09 420 5485

Supplier of industrial spill kits

NZ Safety Blackwoods, Manukau City, 0800 660 660

Checking of spill kits

Completed annually by company Health and Safety Officer

Sewage disposal contractor

Waste Management Technical Services, Neales Road, 09 274 7963

3.17.4.12 Spill – Direct into surface water

1. Safety first. Enter the area only if your personal safety is not at risk e.g. from fumes, toxic substances, unstable tankers, etc.
2. Turn off the source if possible.
3. Notify the Landfill Operations Supervisor immediately by site radio, otherwise by cellphone or direct contact.
4. Notify the authority immediately by telephone. Auckland Pollution Hotline (09) 377 3107.
5. Close off all valves downstream.
6. Close off all sources of water entering the spill site from upstream.
7. Form earth bunds wherever practical to isolate and contain the spill area (e.g. across waterways, on top of mid-pond bunds).
8. Deploy absorbent booms for floating spills (e.g. diesel and oil).
9. Deploy pumps for soluble spills (e.g. leachate, antifreeze, fertiliser) in readiness for pumping elsewhere for treatment e.g. to another truck or another pond.
10. Take water quality field measurements with portable instruments, including pH, conductivity, dissolved oxygen. Measure downstream and upstream of the spill, and upstream and downstream of the confluence with the receiving water such as Rangitopuni Stream.
11. Take grab samples of water at the same locations as field measurements and hold them in a chiller pending advice from the Landfill Engineer or Council regarding independent laboratory testing.
12. Fix the source of spill.
13. Prepare reports according to consent requirements and report to the AC and PRP.
14. Fill in a Waste Management incident report.

3.17.5 Reporting and record keeping

Record of all emergency situation will be maintained on site.

A copy of the approved emergency management plan will be provided to NZ Fire Services for their record.

DRAFT

Appendix A Redvale Landfill location plan for emergency services

DRAFT



WM New Zealand

Scale @ A1: 1:1500
Scale @ A3: 1:3000

CAD file G:\CAD\NZ\RED\LD0\

Project:
Redvale Landfill
Emergency Services
Drawing

Issued for:
Landfill management plan
Project number:

Drawing number:
01

Issue:
A

Survived		Name		Date	
Designed					
Drawn:	ELW				26/05/2025
Checked					
Project Manager:					
Issue	Description	Date	Approved		
A	Emergency Services Drawing	26/05/2024			

The Contractor must check & verify all Dimensions on site before commencement of Works

Appendix B Redvale Landfill neighbours location plan

DRAFT

Redvale Landfill neighbours location plan



3.18 Environmental Management Plan - General

3.18.1 Introduction

3.18.1.1 Resource consents

[Condition XX]

3.18.1.2 Site Activities

The main activity on site is the landfill operation.

The other activities are support functions for the landfill and include a:

- Workshop and associated chemical store;
- Refuelling area;
- Truckwash with primary solids chamber and associated interceptor;
- Primary wash bay and associated interceptor;
- Wheel wash;
- Tray wash (on the landfill and used for washing out the trays of trucks);
- Flare and gas generation compound;
- Waste and oil storage compound associated with gas generation;
- Off site piping for hot water and gas;
- Office building;
- Weighbridge;
- Sealed access route from the main road to the above facilities;
- Climate station.

The flare and gas generation compound also houses a trial biogas unit. This unit is not currently in operation but may operate from time to time. It has an associated scrubbing tower. Spent liquor is directed to the condensate or leachate system.

This EMP mainly concentrates on the above associated activities as the LMP addresses the management of the landfill in depth.

3.18.1.3 Environmental Policy

Redvale Landfill follows the Standard Environmental Policy of Waste Management NZ Ltd (Section 3.18 Appendix D).

3.18.2 Storage of Environmental Hazardous Substances and Secondary Containment

3.18.2.1 Chemical storage

The site has a number of dedicated chemical storage areas. This includes:

- The 5,000 litre double skin diesel tank located in the workshop area. The tank is bunded and roofed. The tank and pipework are appropriately certified. When the site is not operating, the pneumatic fuel pump dispenser is locked.

The bund is constructed of painted steel and has a capacity of ~50,000 litres.

Redvale Landfill Management Plan

- The 2,300 litre bunded waste oil tank. This bund is not roofed. The liquid collected in this bund drains via a pipe into the pipework channel associated with the diesel tank. This channel discharges via the three-stage interceptor connected to the truck wash chamber.

The bund is constructed of concrete blocks and has a capacity of ~3,000 litres.

The bund is usually drained when there is about 10 cm of water in its base. Before the valve is opened, the water is visually checked for clarity. If it is clear, it will be discharged to the interceptor.

If there is a rainbow sheen on the water's surface, Waste Management Technical Services (WMTS) will be asked to remove the liquid during their weekly visit.

The cause of the contamination will be logged as an incident and investigated.

- The LFG generator oil and waste oil tank compound. This facility consists of a bunded area for the two tanks and a concrete unloading/loading pad. Both the bund and the pad each have a stormwater collection sump with an associated shut-off valve. The sumps drain to a three-stage interceptor and from there, into Pond 1. The capacity of the sumps is ~200 litres.

The bund was designed to hold the contents of both tanks plus 20%.

Rainwater collected within the bund will be discharged via the interceptor if there is no oily sheen on the water's surface. The shut-off valves are not fully opened during discharge so the flow is measured.

If the quality of the water is not acceptable, it is pumped and processed through the evaporator.

Rainwater collected in the unloading pad's sump is removed prior to transfer of oil from the pad to the tank.

- The leachate evaporator (Old LEU) bund area. This bund contains the older leachate evaporator, a 30,000 litre leachate storage tank and a 15,000 litre residual sludge tank. The 15,000 litre tank is connected to the 30,000 litre tank. The latter tank has a high-level alarm.

The bund itself has a capacity of 33,000 litres, and contains two, 5,000 litre sumps. The bund is fitted with two level alarms, which are connected to the autodialer system which alerts the Technician on call.

Prior to discharging collected rainwater, the water is tested and released if clean. Otherwise, it is transferred to the leachate tank for processing.

- The Leachate Dosing Plant has a bunded area (BeneVap [BV300] Compound). The bund contains the BV300 leachate evaporator, and three 26,000 litre leachate storage tanks.

The evaporator and storage tanks are equipped with level monitoring, and the bund itself has the capacity to hold 76,000 litres. The bund is fitted with two level alarms, which are connected to the autodialer system which alerts the Technician on call.

Prior to discharging collected rainwater, the water is tested and released if clean. Otherwise, it is transferred to the leachate tank for processing.

- The workshop store. This is a room with concrete walls and floor. The roof structure is of timber. The doors are rated to hold a fire within the room for 120 minutes. The room is graded toward a 1,000 channel and sump. It has not been established whether the room has 110% capacity of the largest 1,370 litre tank; however, as the workshop area all drains to Pond 1, containment is considered adequate.

- The workshop area. Drums and containers of lubricants are stored in the entrance of the workshop. Spill pallets are available; however, a few drums will be stored without secondary containment. This allows for ease of movement i.e. drums do not have to be lifted off pallets when required elsewhere in the workshop. As this area drains to the on-site surface water system, containment is considered adequate.
- A maintenance shed is adjacent to the workshop store. Fertiliser is stored in this location.

All environmentally hazardous substances are stored in a manner that prevents the entry of rainwater into the container and that prevents stormwater runoff from entering into the storage area.

A List of Hazardous Substance is provided in Section 3.18 Appendix C.

3.18.3 Potential Sources of Contaminants and Management

3.18.3.1 Waste compactors and bins

Waste compactors and bins are a potential source of contamination through either leaking of leachate or overfilling.

These are required to be located and operated in such a manner that prevents leachate or waste from leaking from them onto land in a position where it may enter water.

At Redvale, waste skips are not generally used in any area that drains to the site's surface water system or directly off-site into the receiving waters.

Domestic sized wheelie bins are provided for the office, flare site and workshop.

3.18.3.2 Wastewater

Black and grey wastewater is directed to underground septic tanks associated with the gatehouse, workshop, flare site and office facility.

The following has been identified as wastewater associated with industrial activity.

- Leachate;
- Condensate.

Leachate is contained, collected, treated and disposed of on a continual basis by a combination of off-site disposal and treatment in a LFG gas-powered evaporator.

Condensate is removed from the gas collection pipes at condensate traps and returned to the landfill by means of either injection into the waste at the condensate traps or by pumping to the leachate collection system. Upon mixing with leachate, the mixture will then be either treated in the on-site leachate evaporator or recirculated into the waste at the leachate injection well.

Leachate and condensate are managed as part of the landfill operation and are covered in sections 3.7 (Landfill Gas Management) and 3.21 (Leachate Monitoring and Contingency Plan).

Wastewater associated with landfill support functions are:

- Truck and equipment wash water;
- Workshop related wastes;
- Spent scrubber liquor;
- Condensate from three phase air compressors.

The workshop has a compressor located in a compressor shed. Condensate drains into a channel in the shed's concrete floor. This channel is connected to the outside pipework channel that contains diesel piping to the bowser.

The flare site has a compressor located within its workshop building. Condensate is discharged outside the building into a concrete trench. A PVC pipe collects this liquid and rainwater from the trench and discharges it onto the road. This liquid will run as overland flow into the first wheel wash pond.

3.18.3.3 Washwater

There are four sources of wash water on site:

1. The tray wash on the landfill footprint or within the landfill surface water catchment area;
2. The primary wash bay north of the workshop;
3. The truck wash in front of the workshop; and,
4. The wheel wash.

The wheel wash operation is addressed in section 3.8 (Dust Management) of the LMP.

Wash water from the primary wash bay is directed to an adjacent oil and grit interceptor and from there, into a pump chamber. The water is pumped from the chamber via a pipe to a central collection pit on the flare site's northern boundary and from there, to the wheel wash pond.

Wash water from the truck wash is collected into a ~9 m³ chamber that drains to a three-stage interceptor and from there, into a pump chamber. The water is pumped from the chamber to a central collection pit on the flare site's northern boundary. This collection pit is connected to the Pond 1.

Water is also used to wet the haul and wet or wash access roads, these activities are addressed in the Section 3.8 (Dust Management) of the LMP.

Drainage plans for the areas are included in Section 3.18 Appendix A and B..

3.18.4 Monitoring and Review

3.18.4.1 Maintenance and Monitoring

Site generated waste and its management is addressed in the Section 3.2- Disposal of the LMP. This includes the site's interceptor, sumps and cesspit solids. These are cleaned out on a regular basis on a set schedule. The Workshop Supervisor is responsible for managing the contractors that undertake this work.

All facilities are subject to workplace inspections.

Records are kept with respect to diesel and oil use for accounting purposes. These records are available for reconciliation. There is a diesel delivery procedure available from the Workshop Supervisor. This document includes the bowser's volume test record and the calibration record for the mobile fuel truck.

Maintenance and monitoring of the ponds, including the wheel wash ponds, are detailed in Section 3.5.

The amounts of the significant chemicals are tracked and monitored where appropriate as described in separate sections of the Landfill Management Plan.

3.18.4.2 Review

The section; EMP is part of the LMP and it will be reviewed regularly as required.

3.18.4.3 Audit

The site is audited by the ACC each year as part of the ACC Partnership Programme. While this programme is primarily a health and safety audit, it includes an assessment of the site's hazardous substances processes. This is appropriate as the purpose of the Hazardous Substances and New Organisms Act is to *"protect the environment, and the health and safety of people and communities ..."*

The Solids division (including Redvale) of the Company (WMNZ) is also accredited. Redvale is audited as part of this process if selected by the auditing company.

The site is also audited regularly by the WMNZ staff for its compliance in relation to the relevant rules, regulations and resource consent conditions.

Similarly, the compliance officer from the regulatory body, Auckland Council, conduct compliance inspections of the site as per the requirements of the resource consent.

3.18.4.4 Training

It is important that staff understand and are familiar with consent conditions, operational systems and procedures for the site, the stormwater and wastewater systems, and best management practices. All staff will receive instruction and training, both verbal and documented, in all aspects of operational procedures, site licence requirements in relation to operations and the environment, and health and safety.

Training procedures will be in accordance with WM procedures, which will ensure competence and awareness. It is the responsibility of the Site Supervisor and line management to ensure that all staff are familiar with site systems and procedures, and evidence of this bearing the signatures of trained staff should be retained on site.

3.18.4.5 Training management

Training for site staff will be structured around the following progressive steps:

- Induction - corporate
- Induction - site
- Task training
- Refresher training
- New task training

Training topics which must be covered in order to comply with legislation and consents are summarised in the following table:

Essential training topics	
Training topic	Frequency
Job specific training	When doing the job for the first time and thereafter as assessed
Emergency procedures	Periodically at toolbox meetings
Management plan	Annually

Redvale Landfill Management Plan

Training topics that are job-specific may include those on the following guideline list.

General training topics (guideline list)	
<u>Operations -</u> • Special waste handling • Machines • Gas and odour • Waste acceptance and identification • Waste sampling for acceptance tests • Stormwater management • Wastewater management	<u>Safety</u> • Respiratory masks • Eye safety • Hearing safety • PPE • Ergonomics • Planned inspections • WorkSafe and related legislation • Hazard management • Accident / incident management • First Aid
<u>Operations - general</u> • Lock-out tags • Environmental sampling test procedures	<u>Emergencies</u> • Emergency procedures • Evacuation, trial evacuation exercise • First aid • Firefighting, use of extinguishers • Fire wardens • Spill Response
<u>Environmental</u> • Management plan • Environmental awareness • Waste Surveys	

3.18.4.6 Record Keeping - Training

Training records will be kept on site by the site management. As a guide, the list of attendees of a training can be recorded in the format as mentioned in Section 3.18 Appendix D. WMNZ also maintain an online system to record the essential trainings attended and which has a system to notify the person when the training is due for renewal.

3.18.5 Contingency

3.18.5.1 Emergency Response Action Guidelines

The response guidelines in case of potential environmental contamination events are discussed in the sub sections of 3.15 Emergency Management Plan.

3.18.5.2 Reporting

The company has a procedure of reporting of all the health, safety and environmental incidents internally by writing on a paper form followed by entering into an online incident reporting system; Vault. An investigator is assigned to each incident and then actioned as per the findings of the investigation.

Resource Consent conditions require the landfill operator to provide regular environmental (air quality and water quality) monitoring data for Redvale Landfill to the Auckland Council. The

Redvale Landfill Management Plan

specified monitoring will be performed with properly calibrated meters and reported as described in Section 3.7 Landfill Gas Management, Section 3.18 Stormwater Monitoring Programme and Section 3.20 Groundwater.

An environmental performance report will be prepared annually and submitted to the Auckland Council. This will outline the monitoring results and any incidents that happened on site and measures taken to prevent the incidents happening again.

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Appendix A Site Plan

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NOTES:

1. Height Datum: L&S 1946 (Auckland MSL)
2. Origin of Levels: Redvale GPS Base Station 67.345m RL Derived from a Site Calibration
3. Original survey in terms of Geodetic Datum 1949

Waste Management

Landfills & Project Development

P.O Box 228
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New Zealand

Ph: (09) 427 0600
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Waste Management - a division of
Transpacific Industries Group (NZ) Ltd

Drawing Key

- Line A - Landfill Footprint
- Property Boundaries
- Fire Hydrant

Scale @ A1: 1 : 2750

Scale @ A3: 1 : 5500

CAD file: I:\Cad\NZ\Red\Bound\Emerg Plan

Project:
Plan of Redvale Landfill Boundaries
Landfill Access Road, Dairy Flat
Emergency Services
Drawing

Issued for:
Location
Project number:

Drawing number:
01
Issue:
A

	Name	Date
Surveyed:		
Designed:		
Drawn:	B.BOWE	12/12/06
Checked:		
Project Manager:		

Issue	Description	Date	approved

The Contractor must check & verify all
Dimensions on site before commencement
of Works

Appendix B Stormwater Flow from ITA area

DRAFT

- Notes:
- Stormwater Open Channel
 - Stormwater Pipe
 - Sewage Pipe
 - Pump Line
 - Car Park



WM New Zealand

Issue	Description	Approved Date

Engineering, Research & Development
Landfill Access Road,
RD 4, Albany 0794, Auckland
Ph +64 (09) 427 0600
www.wm.nz

Surveyed	Name	Date
Designed		
Drawn	ELW	26/05/2025
Checked	NS, GC	26/05/2025
Scale	EA3 1:1400	

Project:
REDVALE LANDFILL

Issued for:

Drawing Number:

Figure 4.1.7.2 - Industrial Activity Areas SW Plan

Appendix C Hazardous substance list

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HAZARDOUS SUBSTANCE LIST FOR REDVALE

Major Chemical Components	UN No	Cas No	Haz Chem	DG Class	Pk Code	Posions Sc
Acetylene	1001	74-86-2	2SE	2.1A	NA	NA
Argon Gas	1006	7440-37-1	2T	2.2	NA	NA
Oxygen	1072	7782-44-7	2S	2.2	NA	NA
Hydrocarbon Mixture	1075	NA	2WE	2.1	NA	NA
Methyl Ketone	1090	67-64-1	2XE	3.1	II	5
Methyl Ethyl Ketone	1133	78-93-3	2YE	3	II	NA
Ethanol	1170	NA	NA	3	II	NA
Ethanol	1170	64-17-5	2YE	3	II	NA
Ethanol	1170	NA	2Y	3	III	NA
Diesel	1202	NA	3Z	3	III	NA
		86290-81-				
Petrol	1203	5	3YE	3	II	NA
Mid Hexane hydrocarbo	1208	NA	NA	3	II	NA
Isopropyl Alcohol	1219	NA		3	II	NA
Kerosine	1223	8008-20-6	3YE	3	III	NA
Butyl Acetate	1866	NA	3YE	3	II	NA
Liquid Hydrocarbons	1950	NA	2XE	2.1A	III	NA
Solvent Mixture	1950	NA	NA	2.1	NA	NA
Liquid Hydrocarbons/Mineral Oil	1950	NA	NA	2.1	NA	NA
Mineral Oils	1950	NA	NA	2.1	NA	NA
Xylene & Propellant	1950	NA	NA	2.1	NA	NA
Acetone/Dimethyl Ether	1950	NA	2Y	2.1	NA	S5
Mineral Oil/ Surfactant	1950	NA	2Y	2.1	NA	NA
Nitrous Oxide	1950	NA	NA	2.2	NA	NA
Pet Naptha & Silicone	1950	NA	NA	2.1	NA	NA
Acrylate Polymer	1950	NA	2Y	2.1	NA	NA
Naptha petroleum	1950	NA	2Y	2.1	NA	NA
Petroleum Naptha	1950	NA	2Y	2.1	NA	NA
Pet Naptha	1993	NA	3YE	3a	II	NA
Pet Naptha	1993	NA	3YE	3a	II	NA
Ammonia Hydroxide Soln	2672	1336-21-6	2P	8.1	III	6
		64741-88-				
Petroleum Distillates	3077	4	NA	9	III	NA
Petroleum Distillates	3082	NA	2X	9	III	NA
Petroleum Naptha	3082	NA	2X	9	III	NA
Potassium Tetraiodomercurate Soln	3316	7783-33-7	NA	9	II	NA
Amine Soln	3316	5329-14-6	NA	9	II	NA
Ethylenedinitrilotetraacetic acid	3316	64-02-8	NA	9	II	NA
Sulphuric Acid	3316	7764-93-9	NA	9	II	NA
Sodium Hydroxide	3316	1310-73-2	NA	9	II	NA

FIGURE: 4.1.7.4

Appendix D Environmental Policy – Waste Management

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Environmental Policy

1.0 Objectives

At Waste Management NZ Limited and its subsidiaries ("WM") we are dedicated to providing environmentally beneficial and sustainable services, products and solutions to customers and the community that result in reduction, resource recovery, recycling and reuse of waste materials; efficient use of our own resources and conversion of waste to energy.

We are committed to achieving our aim of "Zero Harm" to the environment, and to continually improve our environmental standards for the benefit of the environment, our workers, stakeholders and the community.

We believe that the highest standards in environmental performance are crucial to the success and sustainability of our business.

2.0 WM Achieves these Objectives by:

- a) Developing ways to reduce, recover, recycle, or re-use waste in all aspects of our business, including considering and integrating environmental factors in our decision making process;
- b) Identifying opportunities for the prevention and reduction of pollution, including climate-modifying emissions, and implementing energy efficiency programs throughout the business;
- c) Providing resources to implement and maintain an effective system of environmental management;
- d) Identifying and understanding the environmental hazards inherent to the activities we undertake and effectively assessing, controlling and managing those risks;
- e) Complying with all legal requirements and standards applicable to our activities; and where adequate regulation does not exist, adopting practices that reflect our commitment to environmental compliance;
- f) Setting objectives, targets and key performance indicators which continually drive us to improve our environmental performance;
- g) Providing workers with training and information necessary for them to understand what the impacts of their activities are; and to enable them to work in an environmentally responsible and competent manner;
- h) Liaising, consulting and building relationships with our workers, regulators, local community and other key stakeholders to develop mutual respect for one another and the environment;
- i) Ensuring that incidents are investigated, specifically identifying the causal and contributing factors, so that remedial actions may be taken;
- j) Regularly undertaking audits and inspections of our operations;
- k) Communicating this Policy to workers and interested stakeholders; and reporting on our environmental performance openly and transparently;

3.0 All Workers are required to:

- a) Carry out their work in accordance with WM's environmental policies, processes and procedures;
- b) Assess and manage the environmental hazards and risks associated with the activities they are undertaking; and
- c) Report any incident which generates any actual or potential harm to the environment.

4.0 Application

This Policy applies to all workers and joint venture partners engaged in activities under WM's operational control.

This Policy will be reviewed annually,



Approved by the Managing Director

Date: 5 November 2021

Appendix E Training record register

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TRAINING ATTENDEE REGISTER

WMNZ - V 1.2

Course Name:		Date	
Training Location		Time	
Trainers Name		Duration	

Use a separate register for each training courses delivered and store on file against the attendees name in the Vault data base

	Employee No.	First Name	Last Name	Business Unit / Location	Signature
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

TRAINING ATTENDEE REGISTER

WMNZ - V 1.2

	Employee No.	First Name	Last Name	Business Unit / Location	Signature
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					

Notes:

3.19 Stormwater monitoring and contingency plan

3.19.1 Stormwater Monitoring Programme

3.19.1.1 Stream hydrology

A stream flow monitoring station will be maintained in the Rangitopuni stream at the Richard Road Bridge. The current structure comprises a V-notch weir and a stilling well system to measure the water level behind the weir, which is converted into a flow rate using the site-specific rating curve. The design and operation of the weir was described in a manual sent to Auckland Regional Council (ARC, now Auckland Council [AC]) 18/7/97 and subsequently approved by them.

3.19.1.2 Monitoring/sampling locations

The stormwater will be sampled from the outlet of each of the sediment retention ponds and three different locations in the Rangitopuni Stream named as Site 1, Site 2 and Site 3. The sampling locations for stormwater ponds and wheel wash holding ponds are also outlined in the surface water monitoring plan.

The water chemistry of flow in the off-site channel; which receives flow from the office building and the weighbridge area will be monitored periodically to ensure that there is no discharge of contaminated water to the stream.

The list of monitoring parameters and frequency of monitoring are summarised in Section 3.19 Appendix B.

3.19.1.3 Continuous Monitoring

Continuous monitoring of pond discharge and inlet will be carried out for different parameters. The monitoring meters will be unattended. The continuous monitoring means one measurement every 30 minutes or less. The readings will be delivered to the office by telemetry system. The use of telemetry system will allow seeing the real time readings to make the management of stormwater systems easier. The meters will be maintained in good working order and regularly calibrated in accordance with the manufacturer's specifications.

3.19.1.4 Monitoring schedule

The monitoring programme contained in Section 3.19 Appendix A is summarised in the table below:

Location	Parameters	Frequency	Purpose
Pond 1 to 4 inlets	Conductivity	Continuous telemetric monitoring	To provide an early warning that there might be elevated contaminants or leachate break out
Pond 1 to 4 discharge	Turbidity	Continuous telemetric monitoring	To ensure excessive silt is not carried into receiving waters
	Flow rate	Continuous telemetric monitoring	To ensure discharge flow rates are not exceeded

Redvale Landfill Management Plan

Location	Parameters	Frequency	Purpose
	Suite of Contaminants	Fortnightly, Bi-monthly	To enable assessment of effects and evaluation against trigger levels
Wheel wash	Suite of Contaminants	Prior to release to sediment pond	Confirm wheel wash water meets trigger levels prior to discharge
Rangitopuni Stream	Suite of Contaminants	Every 3 months	To enable assessment of effects and evaluation against trigger levels

3.19.1.5 Pond Inlet and Outlet – Conductivity

A permanent electrical conductivity meter will be installed at the inlet and at the outlet of each of the four main sedimentation ponds to continuously monitor the electrical conductivity of incoming water to the pond and outgoing water from the pond. At times when the permanent meter is temporarily not operational, the inlet and outlet conductivity will be measured with a portable meter and recorded in monitoring record forms.

The purpose of measuring the conductivity of the inlet will be to provide an early warning that there might be a contaminant carried in the water (the conductivity would increase). Similarly, the purpose of measuring the conductivity of the discharged water will be to avoid the chances of discharging the contaminated water which may potentially affect the aquatic lives of the receiving water body.

3.19.1.6 Pond Discharge – Flow Rate

The discharge flow rate from each sedimentation pond will be continuously measured. The system will be designed to achieve an accuracy of $\pm 10\%$. The measurement devices will be maintained and calibrated, and flow records will be kept and reported in the same manner as for the conductivity. Two devices are required. The first device will measure flow rate in the discharge pipe from the service spillway to the stream. Since 1995, this has been by way of a V-notch weir and stilling well, with water levels converted into flow rate using a rating curve calculation. The second device will measure flow rate over the emergency spillway. Since 1995, this has been by way of pond water level meter, with water levels converted into flow rate using a rating curve calculation.

3.19.1.7 Pond Discharge – Temperature

The temperature of the discharged water from each sedimentation pond will be continuously monitored. The readings will be taken, delivered by telemetry system and recorded in computers files. A site laboratory temperature meter will be used during down time.

The purpose of measuring the temperature is to assess the possible impact on the stream ecology due to the difference in temperature of discharged water and the temperature of the recipient water body; Rangitopuni Stream.

3.19.1.8 Pond Discharge – Water Chemistry

A sample will be taken from the flow discharging from each sedimentation pond on a fortnightly, 3-monthly and 6-monthly intervals. A grab sample from the pond outlet will be undertaken if the continuous monitoring results obtained at the pond outlet shows electrical conductivity exceeded the approved trigger level as per the contingency plan (Section 3.19.2.5). If the outlet valves are closed and no water is being released, then the sample will be taken from the pond near the outlet

structure. A proper written sampling procedure will be maintained and followed (Section 3.19 Appendix C).

3.19.1.9 Wheel Wash

The wheel wash will be flushed out as part of operation and maintenance. Periodically, the flushing and/or recirculating water will be sent to the wheel wash water holding pond. Any water held in the wheel wash water holding pond will be sampled and analysed. When testing shows the water quality to be acceptable, the pond will be emptied by pumping or draining to an on-site sedimentation pond. Discharges from the holding pond will be discrete events rather than a continuous flow. The detailed list of the parameters to be analysed are listed in (Section 3.19 Appendix B).

3.19.1.10 Rangitopuni Stream – Flow Rates

The stream level will be logged at the site continuously (reading in every 30 minutes or less) and sent by radio telemetry to the site office. The flow rate will be calculated in the computer at the site office which records the information in electronic files. In case of weir removal to support the migration of fish in the stream, there won't be enough flow in the stream during summer. Waste Management will continue to sample the stream if there is enough water flowing.

3.19.1.11 Rangitopuni Stream – Water Chemistry

Samples will be taken on a three monthly basis from the three monitoring sites shown in the figure below. Proper sampling procedures will be followed as described in the surface water monitoring plan set out above.



3.19.1.12 Sampling, Analytical Methods and Detection Limits

The sampling and chemical analysis of the samples will be carried out in accordance with guideline values for the protection of 95% of the freshwater species or other standard guideline values approved in writing by the Auckland Council as described in consent [Condition XX].

3.19.1.13 Baseline Monitoring Results

The surface water samples were obtained on a quarterly basis during July 1991- Aug 1993 from three different stream sites; site 1, 2 and 3. The baseline results for electrical conductivity, chloride, potassium and chemical oxygen demand showed a strong inverse relationship to stream flow rates. However, there was a strong direct relationship of dissolved oxygen, sulphate and dissolved aluminium with stream flow rates. The detailed explanation of the baseline results for the sites are summarised in Woodward-Clyde (NZ) Ltd report¹¹.

3.19.1.14 Pond water abstraction

Water is obtained from Ponds 1 to 6.

As at 2026, the water from Ponds 5 and 6 is pumped to water tanks on elevated ground, from which it is reticulated to hydrants accessible by water trucks. Similarly, the water for second wheel wash system is pumped from Pond 1 to the tanks present at the top of the landfill (approximately at 100mRL) which is then gravity fed to the wheel wash system. A fast fill valve is connected between the wheel wash and the tanks for the water trucks to fill. The water from the other ponds is periodically managed in other ways (gravity feeds, portable pumps) whenever required.

The on-site uses for water will include but not be restricted to:

On-site system	On-site use
Direct from trucks	• earth fill control • dust suppression • road washing • refuse haulage truck tray washing • topping up the hilltop tanks
From the reticulated water supply	• fire hydrant supply • wheel wash rinse water • topping up the wheel wash recirculating water ponds • truck wash bay hoses • farm troughs • workshop non-potable system
From the reticulated potable water supply	• workshop potable water • new office potable water • farm troughs • odour spray units

A flow measurement procedure; pump meter, is used to record the water abstraction from the pond. Recording systems will be accurate to $\pm 5\%$ and $\pm 1 \text{ m}^3$. Pump meters will be installed to the manufacturer's specifications and will be maintained in working order. Meter readings will be taken on a weekly basis.

3.19.1.15 Routine Evaluation of Results

Readings from all monitoring will be reviewed by the Landfill Engineer or its nominee either daily or upon receipt of results from independent analytical laboratories. The results will be compared to response limits or "trigger levels" as defined in the stormwater monitoring contingency pla. If no response limit is exceeded, then routine monitoring will continue and results will be sent to the AC

¹¹ Woodward-Clyde (NZ) Ltd 1993, Surface Water Quality Baseline Study for Redvale Sanitary Landfill Final Report, reference no 2450.07.

annually as part of the annual report. If any response limit is exceeded, then procedures will be followed in accordance with the contingency plan.

3.19.1.16 Record Keeping and Reporting

Results from field testing and from the laboratories will be collated in electronic computer tables, as either spreadsheets or databases.

The results of monitoring will be routinely reported to the AC on an annual basis. The content of the annual reports to the AC will include but not limited to:

- All aspects of the performance of the EMP;
- Summary of all revisions or revised sections of the EMP;
- Summary details of all inspections and maintenance of the stormwater system for the preceding 12 months;
- Details of person(s) or body responsible for maintenance of site and the organisations structure supporting this process;
- Results and analysis of the preceding 12 months of stormwater monitoring along with an interpretation of those results and suggestions for improvement to the site operations;
- Record of any spills or incidents which occurred within the previous 12 months and the response which was undertaken; and
- Results from continuous monitoring results

A copy of the annual report to the AC will be sent to the PRP.

Records will be maintained for the operating life of the landfill, or longer if specified in the post-closure management plan.

Surface water monitoring information will also be included in monthly reports to the PRP when the information is considered relevant to the PRP's mandate to understand the landfill's general performance and detailed design.

After completion of first 3 years of monitoring of the water quality, a monitoring report will be submitted to the AC. The monitoring report will include but not limited to:

- A summary of the monitoring results to date;
- An interpretation of those results and suggestions for improvement to the site operations;
- A programme for ongoing monitoring including the reporting of results; and,
- A programme for ongoing maintenance of the stormwater management and treatment system.

3.19.2 Contingency

3.19.2.1 Response limits (Trigger Levels)

Response limits (or trigger levels) are values for the monitoring parameters which, if exceeded, require a course of action to be taken. As at 2015, the TL2s have been set for all the pond outlets and stream sites 2 and 3. The trigger levels were set on the basis of baseline monitoring results and the guideline values for the protection of 95% of the freshwater species or any other standard guideline values approved in written by AC. Upon completion of a monitoring event, the results will be checked against the pre-specified response limits. If no response limit is exceeded, the monitoring event will be routinely reported in due course. If any response limit is exceeded, action will be taken immediately as described in this contingency plan. The response procedures are summarised in Section 3.19 Appendix E. The limits are set at two levels (Section 3.19 Appendix F and Appendix G).

Trigger Level 1 (Lower response limit)

Exceedance of TL1 warns of potential adverse effects, warns of potential future non-compliance with the resource consent conditions, requires investigation and reporting, and might require remedial action. TL1 is reached if one or more individual parameters exceed the listed TL1 limits (Section 3.19 Appendix F).

Trigger Level 2 (Upper response limit)

Exceedance of TL2 will be regarded as strong indication that significant environmental harm and breaches of consent conditions either have occurred, are currently occurring, or are about to occur. The upper limits will be set either at the limits (if any) specified in the resource consent, or at limits which if exceeded indicate non-compliance, or at limits which would require the specialist adviser to be called on average once every 3 years. Exceedance of TL2 usually requires urgent mitigative actions, notification of authorities, calling the specialist adviser, and prompt investigations and remedies. TL2 is reached if one or more parameters exceed the listed TL2 limits (Section 3.19 Appendix G).

Emergency

Extreme Exceedance of TL2 might require reference to the emergency plan.

TL1 for Pond 4 inlet and outlet conductivity

The trigger level TL1 was set at 75 mS/m for the main sedimentation ponds based on background monitoring in the stream and in water on the site prior to start up.

In the case of Pond 4, commissioning did not take place until 20/5/09 by which time a substantial record of background conductivity measurements had been taken in surface water flows from the relevant West Property catchment. It was found that the original and natural run-off had average conductivity in excess of 75 mS/m, so using this value for TL1 would have been meaningless. The record of measurements was analysed to set TL1 at the more practical limit of 106 mS/m, being mean plus 2.5 standard deviations. The TL2 limit has been kept at 150 mS/m as for other ponds because it remains a fair indicator of circumstances that require a TL2 type of response.

3.19.2.2 Definition of leachate contamination

The terms “Leachate contamination”, “contamination” and “contaminant...discharge to water” in the consent conditions are taken to mean:

- TL2 has been exceeded in monitoring at a pond inlet or outlet, and;
- There is observed or measured evidence of the presence of the presence of leachate or site-derived liquid contaminant in any watercourse or pond outside somewhere outside the landfill footprint, and;
- Independent specialist advice has found that a significant change has occurred to the quality of surface water discharging from the site (or in ponds about to discharge from the site) due to leachate.

This definition aims to encompass all events for which the AC expects notification and liaison in regard to response actions, instead of waiting to obtain conclusive proof of leachate contamination.

If investigation of a monitoring result or observation subsequently reaches a different conclusion from the first call, i.e. that leachate either was or was not the cause, then the event must be re-rated retrospectively accordingly.

With reference to condition 125 “*If the results of the monitoring show contaminants exceeding the agreed trigger levels described in the SCMP*” the term contaminants should be applicable to volatile acid compounds (VAC) and phenols only.

3.19.2.3 Response guidelines

These response guidelines provide an indication of appropriate responses which should be taken, but are not obligatory if considered inappropriate or unnecessary at the time (unless otherwise indicated).

Monitoring event	Response guidelines
Pond inlet conductivity	<u>Verification of readings (TL1 and TL2)</u> - Inspect the monitoring site to check that the instrument is functioning correctly - Inspect the monitoring site to check that there is flow (zero flow means TLs won't apply, but will still be reported with explanations in the quarterly reports) - Check the telemetric monitoring outputs for consistency across the site - Use portable meters to repeat or take parallel readings <u>Urgent remedial and precautionary action (TL2 only)</u> - close the outlet decant valve, so that discharge will only occur over the service spillway after the pond is full i.e. dilution is maximised and impact if any on the stream is minimised - turn off (or turn on) leachate extraction pumps according to observations - follow emergency procedures as for a spill - close off any water inputs to the surface water system <u>Urgent remedial and precautionary action in the case of very low flow rate</u> - If the conductivity is more than 50% above TL2 regardless of flow rate, ignore the very low flow rate provisions as follows and proceed according to the full contingency plan flowchart process. - Use site resources to immediately take field measurements at both the monitoring site and pond outlet (if not already taken at Step D) and to assess the source of the TL2. - If the source is reasonably assessed as leachate breakout regardless of flow rate, proceed in accordance with the flowchart (Section 3.19 Appendix E) and response guidelines. - If the source is land management activity and the flow rate is very low (less than approximately 2.0 litres/minute), then follow steps H, J K, L, N (Section 3.19 Appendix E). - Note: Very low flow rate may be combined with TL exceedance due to land management activities e.g.: spreading freshly excavated clay as cover; exposing natural ground which initially yields run-off high in soluble ions; placing topsoil; seeding and fertilising; animal grazing; spreading gravel such as limestone on road surfaces; passing of a water truck washing the adjacent road; natural vegetation die-off; stagnation of water in dry weather. - In all cases, record findings for the regular annual report. <u>Verification of measurements (TL1 and TL2)</u>

Redvale Landfill Management Plan

<u>Monitoring event</u>	<u>Response guidelines</u>
	• measure pond inlet conductivity with a portable calibrated meter • compare against the telemetry results for the pond discharge conductivity. • If conductivity of discharge exceeds the trigger levels, then follow the contingency measures for the exceedance of trigger level for pond discharge conductivity as explained below. <u>Planned corrective and preventative action (TL1 and TL2)</u> • alter the pond discharge flow rate to allow for dilution into the stream before stream conductivity reaches its TL1 • cease discharging from the pond altogether before the pond discharge conductivity reaches its TL1 • isolate any identified sources of contaminated water
Pond discharge conductivity	<u>Verification of readings</u> • Inspect the monitoring site to check that the instrument is functioning correctly • Inspect the monitoring site to check that there is flow (zero flow means TLs won't apply, but will still be reported with explanations in the quarterly reports) • Check the telemetric monitoring outputs for consistency across the site • Use portable meters and the site laboratory to repeat or take parallel readings of conductivity and flow rate If not already done, take a grab sample from the pond discharge flow and analyse it for List F parameters specified in Condition XX (TL2 consent requirement). Add metals and other parameters considered likely to help identify whether or not the source is leachate. <u>Urgent remedial and precautionary action (TL2 only)</u> • close the decant valve, so that discharge will only occur over the service spillway after the pond is full i.e. detention time is maximised <u>Urgent remedial and precautionary action in the case of very low flow rate</u> • If the discharge conductivity is more than 50% above TL2 regardless of flow rate, ignore the very low flow rate provisions below and proceed according to the full contingency plan flowchart process. • Use site resources to immediately take field measurements of conductivity and flow rate at the pond outlet if not already taken at Step D. • If the flow rate is very low (less than approximately 2.0 litres/minute), then follow steps H, J, K, L, N (Section 3.19 Appendix E). Note: The final discharge sluice valves might not be perfectly water-tight when closed. These valves may be closed with the aim of preventing discharge while pond water is being held to allow greater sedimentation to occur within the site, but there may be a residual small "trickle" discharge. If the discharge flow rate from the pond is very low i.e. a trickle, then the impact on the receiving water will be less than minor or too small to measure. • In all cases, record findings for the regular annual report.

Redvale Landfill Management Plan

<u>Monitoring event</u>	<u>Response guidelines</u>
	<u>Planned corrective and preventative action (TL1 and TL2)</u> • close the decant valve, so that detention time is maximised • open the decant valve only when the stream is in flood, to avoid specific environmental harm, and to provide capacity to increase detention time to reduce sediment load for cleaner discharge during sensitive low flow periods.
Pond discharge water quality	<u>Urgent remedial and precautionary action (TL2 only)</u> • close the service spillway gate <u>Verification of measurements and investigation (TL1 and TL2)</u> • follow the previous advice of the specialist adviser if a previous equivalent exceedance occurred • inspect catchments to identify significant contributing sources and their possible relationship with the triggered parameters e.g. freshly excavated natural ground, landfill, farmland, etc. (response actions will depend on whether the parameters relate to leachate instead of other sources). • take samples and/or field parameter measurements within the site as well as at the point of discharge <u>Planned corrective and preventative action (TL2)</u> If a leachate contamination event is confirmed, remedial actions will be tailored according to the investigation findings. Possible actions include: • treatment of contaminated water in the ponds themselves • pumping of contaminated water back to ponds at the heads of the catchments • treatment of contaminated water by spray irrigation • closure of wheel wash • disposal of contaminated water in the landfill or leachate system • trucking contaminated water to a waste water treatment plant • use of contaminated water for moisture conditioning of earth materials for landfill construction • repair the source of leachate • change work procedures to manage risk of recurrence
Pond discharge turbidity	<u>Verification of readings</u> • Inspect the monitoring site to check that the instrument is functioning correctly • Inspect the monitoring site to check that there is flow (zero flow means TLs won't apply, but will still be reported with explanations in the annual reports) • Check the telemetric monitoring outputs for consistency across the site

Redvale Landfill Management Plan

<u>Monitoring event</u>	<u>Response guidelines</u>
	• Use portable meters and the site laboratory to repeat or take parallel readings <u>Urgent remedial and precautionary action (TL2 only)</u> • close the decant valve, so that discharge will only occur over the service spillway after the pond is full i.e. dilution is maximised and impact if any on the stream is minimised, while other emergency treatment is activated. <u>Urgent remedial and precautionary action in the case of very low flow rate</u> • If the discharge turbidity or conductivity is more than 50% above TL2 regardless of flow rate, ignore the very low flow rate provisions below and proceed according to the full contingency plan flowchart process. • Use site resources to immediately take field measurements of turbidity and flow rate at the pond outlet if not already taken at Step D. • If the flow rate is very low (less than approximately 2.0 litres/minute), then follow steps H, J, K, L, N (Section 3.19 Appendix E). Note: The final discharge sluice valves might not be perfectly water-tight when closed. These valves may be closed with the aim of preventing discharge while pond water is being held to allow greater sedimentation to occur within the site, but there may be a residual small “trickle” discharge. If the discharge flow rate from the pond is very low i.e. a trickle, then the impact on the receiving water will be less than minor or too small to measure. • In all cases, record findings for the regular annual report. <u>Planned corrective and preventative action (TL1 and TL2)</u> • close the decant valve, so that detention time is maximised • open the decant valve only when the stream is in flood, to avoid specific environmental harm, and to provide capacity to increase detention time to reduce sediment load for cleaner discharge during sensitive low flow periods.
Wheel wash holding pond water quality	<u>Urgent remedial and precautionary action (TL2 only)</u> • hold water in the holding pond without discharge <u>Verification of measurements and investigation (TL1 and TL2)</u> • calculate whether discharge from the holding pond, after dilution into Pond 1, will cause Pond 1 water to exceed its TL1 • review sources of water input and nature of vehicles which have been washed • analyse for additional parameters

Redvale Landfill Management Plan

<u>Monitoring event</u>	<u>Response guidelines</u>
	<u>Planned corrective and preventative action (TL1)</u> - discharge to the pond if calculations for dilution into the pond are acceptable (the Company agrees to set conservatively low response limits to discourage this practice) - dispose of the water by irrigation onto grassed cover or landfill roads - Planned corrective and preventative action (TL2) - chemically treat the water in the holding pond, and dispose of sludges in the landfill - treat the water as leachate, e.g. by injection into the landfill
Pond discharge flow rate	<u>Urgent remedial and precautionary action (TL2 only)</u> - Partly close or lower further the penstock valve on the service spillway. <u>Planned corrective and preventative action (TL1 and TL2)</u> The event will be over before much can be done. Possible preventative actions include: - redesign and reconstruct ponds and spillways - divert flows to re-size catchments for ponds
Rangitopuni Stream water quality	<u>Urgent remedial and precautionary action (TL2 only)</u> - Notify the authority. Ph (09) 301 0101 24hr or (09) 3773107 Pollution Hotline. <u>Verification of measurements and investigation (TL1 and TL2)</u> - Investigate whether the landfill could be the source of stream contamination, by observation, review of test results, and by additional testing if appropriate of landfill site sources. <u>Planned corrective and preventative action (TL2)</u> - If a leachate contamination event is confirmed, remedial actions will be tailored according to the investigation findings - the same as for pond discharge water quality as above. - If the source is not landfill, assist Council as requested.
Sediment retention pond contamination with leachate	<u>Urgent remedial and precautionary action (TL2 only)</u> See emergency management plan Section 3.17 - Leachate Spill <u>Options for corrective action (TL1 and TL2)</u>

Redvale Landfill Management Plan

<u>Monitoring event</u>	<u>Response guidelines</u>
	• Pump pond water to a holding pond to be formed on the existing landfill where the contaminated water will partly soak in and partly be progressively treated as leachate. • Pump pond water direct to the site's leachate treatment system. • Pump pond water into trucks for cartage to a sewage treatment plant. • Pump pond water back up the landfill drainage system either to primary ponds or to vegetated cover where it will benefit from aeration and attenuation. • Aerate the pond water by any practical means e.g. jetting into the air back over the ponds - This might suffice for slight contamination. • Pump pond water out to another sedimentation pond in small amounts for assimilation. • Pump pond water in from another sedimentation pond for rejuvenation. • Hold water back to the maximum level in the pond to mitigate effects by dilution with fresh inflows and rainfall. • Chemically treat the pond water in place - This could be a mitigative measure to reduce selected parameters in the event of a particularly high level of contamination. • Afterwards, excavate contaminated pond sediment and dispose of it in the landfill.

3.19.2.4 Specialist adviser

WMNZ will consult a specialist adviser as required. The specialist adviser person shall be an external person having relevant experience.

3.19.2.5 Reporting

Potential contamination event	Reporting
(a) No TL exceeded.	Routine annual report to AC.
(b) TL1 exceeded.	Routine annual report to AC.
(c) TL2 exceeded.	Notify AC immediately. Liaison regarding corrective actions.
(d) Specialist adviser has confirmed that a change has occurred to surface water quality due to leachate and that the change has been significant.	Report to AC. Separate event follow-up report.
(e) All events.	Copy to PRP of annual report to AC .

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Appendix A Stormwater monitoring locations

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Redvale Landfill

Stormwater Monitoring Locations



Redvale Landfill

Landfill Access Road, Dairy Flat,
Auckland PO BOX 228, Silverdale,
Auckland, New Zealand.

Telephone 09-427-0600

Fax 09-426-8284

Email

redvale@wastemanagement.co.nz

Figure: 4.3.3.1

Appendix B Lists of Monitoring Parameters

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REDVALE LANDFILL



WATER QUALITY ANALYSIS PARAMETER LISTS

	LIST> WHEN>	A Before discharge	B 14 days	N Monthly	C 3 months	E 3 months	O 3 months	F high outlet conductivity	K 3 months (1st year only)	H 6 months	P 6 monthly	HP 6 monthly	L 1 year
	TYPE>	Wheel wash holding pond	Pond discharge	Pond discharge (or pond)	Pond discharge & Stream Sites	Ground water wells	Pond discharge (or pond)	Pond discharge	Ground water wells	Pond discharge & Stream Sites	Stream	Stream	Ground water wells
	FROM>	1 w/w pond	Ponds 1 to 4	Pond 6	Ponds 1 to 4 & Stream Sites 1 to 3	WM1B, M7A, M8A, M9A, M10A, M2B, M1A, M11A	Pond 6	Ponds 1 to 4	WM1B, M7A, M8A, M9A, M10A, M2B, M1A, M11A	Ponds 1 to 4 & Stream Sites 1 to 3	Rangitopuni Stream Sites 2, 3, 4	Rangitopuni Stream Sites 2, 3, 4	WM1B, M7A, M8A, M9A, M10A, M2B, M1A, M11A
	CONSENT>	REG-61342 (NRSI- 42570)	REG-61342 (NRSI- 42570)	39714	REG-61342 (NRSI- 42570)	REG-61341 (NRSI- 42369)	39714	REG-61342 (NRSI- 42570)	REG-61341 (NRSI- 42369)	REG-61342 (NRSI- 42570)	39714	39714	REG-61341 (NRSI- 42369)
	CONDITION>	147 [g]	120, 147 [d]	57	124, 147[e]	90	57	120	87	124, 125, 143 [e]	59	59	91
Alkalinity			*		*				*			*	*
Aluminium dissolved					**	**			**	**		**	**
Aluminium total													
Ammonia N total		*	*	*	*	*	*	*	*	*	*	*	*
Arsenic dissolved					**		*		*	**	*	*	*
BOD5													
Boron						*			*				*
Cadmium dissolved					*		*		*	*	*	*	*
Calcium					**				*	**		**	*
Chloride			*			*		*	*	*	*	*	*
Chromium dissolved					*		*		*	*	*	*	*
COD			*		*			*	*	*	*	*	*
Conductivity field		**	**	*	**	**		**	**	**	*	*	**
Conductivity lab		*	*	*	*	*	*	*	*	*	*	*	*
Copper dissolved					*		*		*	*	*	*	*
Hardness					*				*	*	*	*	*
Iron dissolved					**		*		*	*	*	*	**
Iron total					*				*	*	*	*	*
Lead dissolved					*		*		*	*	*	*	*
Magnesium					**		*		*	**	*	**	*
Manganese dissolved					**		*		*	**	*	*	*
Nickel dissolved					*		*		*	*	*	*	*
Nitrate N						*			*	*	*	*	*
Oxygen diss. field			*	*	*		*	**	*	*	*	*	*
pH field		**	**	*	**	**	*	**	**	**	*	**	**
pH lab		*	*		*	*	*	*	*	*	*	*	**
Phosphorus total									**				**
Potassium					**				*	**		**	*
Sodium					**				*	**		**	*
Sulphate					**				*	**		**	*
Suspended solids		*	*		*				*	*	*	*	*
Temperature field		*	*	*	*		*	*	*	*	*	*	*
Turbidity field						**			**	**	*	*	**
Turbidity lab				*	*	*	*		*	*	*	*	*
Zinc dissolved					*		*		*	*	*	*	*
Zinc total		**			*				*	*	*	*	*
Cation/Anion balance					**				**	**		**	**
Oil & grease		*			*				*	*	*	*	*
Volatile Acids						**			**	*	*	*	**
Phenols total									**	*	*	*	*
Volatile organics													
Semi-volatile organics													
Flow rate field estimate			*		*		*		*	*	*	*	*
Total Petroleum Hydrocarbons (TPH)					*		*		*	*	*	*	*
Organochlorine Pesticides (OCP including DDT compounds)							*			*	*	*	*
Polycyclic Aromatic Hydrocarbons (PAH)							*			*	*	*	*
Water depth										*	*	*	*
Results required by		1 week	1 week		2 weeks	2 weeks		1 week	3 weeks	2 weeks		3 weeks	3 weeks
Note 1: "Field" means measurement by WM Redvale site staff either at the sample site or in the site laboratory.													
Note 2: Dissolved = either field filtered by WM Redvale site staff or filtered by the analytical lab if the sample is delivered in a short time.													
* = Measurement required by consent conditions, from Landfill and Managed Fill													
** = Analysis not required by consent conditions but required occasionally by WM.													
Figure 4.3.3.2													

Appendix C Surface Water Sampling Procedure

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WORK INSTRUCTION FORM

HSEQ Management System



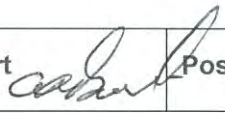
Date:	13/12/2016			Risk Assessment No:	
Division:	Waste Management NZ		Branch/Site:	Redvale Landfill	
Task Location:	Redvale Landfill		Work Activity:	Surface Water Sampling	
Permits / Authorisations required:	WORK PERMIT ☐ BREAKTHROUGH ☐ CONFINED SPACE ☐ HOT WORK ☐ FALL PREVENTION ☐				
Work Instruction undertaken by:	Daya Gautam	Position Title:	Environmental Engineer	Date:	13/12/2016
Comments					
First Stage Approval:	Andy Vosper 	Position Title:	Regional Manager	Date:	13/12/2016
Comments					
Final Approval:	Andrew Burt 	Position Title:	HSE Advisor	Date:	13/12/2016
Comments:					

FIGURE: 4.3.3.3

FIGURE: 4.3.3.3

WORK INSTRUCTION FORM

HSEQ Management System



WORK INSTRUCTION			
Task	Steps (This includes what to do and related control measures)	Key Points	Responsible person (optional column)
Calibration - Ensure the field instruments are correctly calibrated	Follow the calibration instructions for each field instrument you use in performing this task	Instrument calibration is necessary to get accurate readings	Environmental Monitoring Technician
Order Bottles - Order sample bottle sets	Sample bottles should arrive from the analytical laboratory approximately one week before being needed for sampling, this occurs automatically from the Sampling Schedule which is sent to the analytical lab at the beginning of each calendar year	Be aware of any preserving acids leakage from bottles that could be harmful to skin and clothes. Ensure that gloves are worn.	Environmental Monitoring Technician
Ice bricks are ready for use	Ensure ice bricks are in the freezer the night before sampling		Environmental Monitoring Technician

FIGURE: 4.3.3.3

WORK INSTRUCTION FORM

HSEQ Management System



Documentation - Register the sample bottle numbers in the Environmental Monitoring Sample Register	1) Obtain sample bottle sets 2) Obtain the Environmental Monitoring Sample Register and enter the details of each sample set. 3) Keep to the sequence used previously (e.g. List B), so that the computer system (Excel) does its automatic updates correctly in subsequent steps. 4) Complete the following fields for each sample bottle, in the Environmental Monitoring Sample Register: ...Date : date of sampling, not document preparation. ..Samples : person initials ..Location: actual sample location. ..Bottle: eg. 100/P/P/F/C 100ml / Plastic/ Preserved/ Filtered/Chilled. .. Analyte: eg. List E. .. Lab: eg. Hill's .. Chain of Custody#: net consecutive # .. Analyte: eg. List E. .. Lab: eg. Hill's .. Chain of Custody#: net consecutive #		Environmental Monitoring Technician
Documentation - Mark Sample Bottles	Copy the WM Environmental Monitoring Sample Register numbers onto the correct bottles using an indelible waterproof pen,	Documentation should be done accurately to avoid any confusion about sample numbers in either WM Lab or the Testing Lab.	Environmental Monitoring Technician

FIGURE: 4.3.3.3

WORK INSTRUCTION FORM

HSEQ Management System



	along with any other information (eg date) required by the independent lab.		
Documentation - Prepare the Field Sheets and the Chain of Custody form	1) The Chain of Custody forms are set up in Excel on the computer (in, for example: spreadsheet "CoCs Hills.xls"). Open the workbook . Open the correct CoC worksheet for the Sampling round in question (eg List B). 2) Enter (or change) the fields in blue colour only, these are: Date, Purchase number, sampler and the first WMNZ bottle number of the first set from the Register. The system will then fill in all consecutive numbers on the CoC form. Check these are correct. 3) Save and print the CoC form 4) Open the Surface water Field Sheets workbook (from SurfaceWater.xls) in Excel and reply "yes" to the "Update ? " question. This automatically updates the relevant fields on the appropriate worksheets. Check that the WMNZ sample Numbers on each sheet. 5) Open the first sheet in the workbook for the List in question e.g. "List B1". Check that the date, CoC, sampler and Purchase Order Number are correct. The only field requiring update (in blue) should be the "Turbidity Sample #". Enter the correct number from the Sample Register and the system will automatically update the Turbidity Sample	Check that the WM Sample Numbers on each sheet of the Sampling Round being undertaken (e.g. List B) are matching those in the Sample Register.	Environmental Monitoring Technician

FIGURE: 4.3.3.3

WORK INSTRUCTION FORM

HSEQ Management System



	Numbers on all the remaining worksheets. Check that these now all match those in the sample Register. Save & print the field Sheets		
Taking Samples	1) Set sample bottles in a chilly bin with ice bricks after writing on the sample numbers and date immediately prior to sampling. 2) If the Pond is discharging then take samples from the outlet weir, if not then take them from the pond margin, avoiding stirred up sections. 3) Transport the equipment to the appropriate location. 4) Put on disposable gloves. 5) Fill all the bottles in the sample set for the current location, as well as a sample for turbidity measurement back at the lab. Use the sampling pole if necessary. 6) Place samples - after filling - in the chilly bin. 7) Measure pH, temperature, conductivity and dissolved Oxygen at the sample point. Record the data on the Field Sheet. 8) Record sampling time, weather conditions, clarity, colour, odour and sheen, and any	Avoid any source of contamination. This could affect the samples of each pond or cross contamination between the samples of different ponds may occur. 	Environmental Monitoring Technician FIGURE: 4.3.3.3

WORK INSTRUCTION FORM

HSEQ Management System



	other comments, onto the Field Sheet for the location being sampled.		
Dispatching Samples	1) Complete Purchase Order Form including the following details: Description of required analysis or refer to the COC Number. Approximate cost. Cost coding or reference, eg. Surface water sampling. Cross through unused lines and get supervisor to sign purchase order. 2) Attach both the Purchase Order book and attach to CoC. 3) Transfer samples from WM chilly bin to the independent lab chilly bin. Add one to three ice bricks and packing material as appropriate. 4) Include CoC and Purchase Order with samples to be delivered to the analytical laboratory. 5) Seal and address chilly bin, stick on Courier label and place in front office before 15:30hrs ready for collection.	All the required samples should be taken and sent to the analytical lab on the same day. 	Environmental Monitoring Technician

FIGURE: 4.3.3.3

WORK INSTRUCTION FORM

HSEQ Management System



Prepared in consultation with:	Jourdan Alexander
Approved by:	Andy Vosper
Signature:	<i>[Handwritten Signature]</i>

I have read and understood the attached Work Instruction (Enter name and sign)			
Operators Name:		Operators Signature:	
Operators Name:		Operators Signature:	
Operators Name:		Operators Signature:	

Office use only: (the section below to be completed by Supervisor)			
PERMIT TO WORK	☐ Yes ☐ No	WORK INSTRUCTION	☐ Yes ☐ No
		AUTHORITIES REQUIRED:	☐ Yes ☐ No (Tick below)
BREAKTHROUGH	☐ Yes ☐ No	CONFINED SPACE	☐ Yes ☐ No
		HOT WORK	☐ Yes ☐ No
		FALL PREVENTION	☐ Yes ☐ No
Supervisor name:	Supervisor Signature:		Date: / /

FIGURE: 4.3.3.3

Appendix D Water Quality Test Methods

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WATER QUALITY ANALYSIS PARAMETER TEST METHODS

PARAMETER	UNIT	Detection Limit	Method
Alkalinity	g/m3 as CaCO ₃	1	Titration APHA 2320 B
Aluminium dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B].
Aluminium total	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B].
Ammonia N total	g/m3 as N	0.005	Automated phenate spectrophotometry [APHA 4500-NH ₃ G
Arsenic dissolved	mg/m3	1	Continuous flow hydride generation AAS [APHA 3114 C]
BOD ₅	g/m3	0.1	Membrane electrode APHA 5210 B
Boron	mg/m3	5	Azomethine H Spectrophotometry CSTPA
Cadmium dissolved	mg/m3	0.05	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B].
Calcium	g/m3	0.1	Flame AAS [APHA 3111 B]
Chloride	g/m3	0.5	Ion chromatography [APHA 4110 C]
Chromium dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Chemical Oxygen Demand, COD	g/m3	1	Closed reflux colorimetric method [APHA 5220 D Hach]
Conductivity field	mS/m	0.1	Portable meter
Conductivity lab	mS/m	0.1	Meter APHA 2510 B
Copper dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Hardness	g/m3 as CaCO ₃	1	EDTA titration APHA 2340 C or calc if Ca and Mg determ APHA 5220B
Iron dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Iron total	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Lead dissolved	mg/m3	0.5	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Magnesium	g/m3	0.1	Flame AAS [APHA 3111 B]
Manganese dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Nickel dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Nitrate N	g/m3 as N	1	Automated Cadmium reduction spectrophotometry [APHA 4500-NO ₃ F]
Oxygen diss. field	mg/m3	0.1	Portable meter
pH field		0.1	Portable meter
pH lab		0.1	Glass electrode APHA 4500-H+
Phosphorus total	g/m3	0.005	Acid persulphate digestion; automated ascorbic acid reduction [APHA 4500-P B, F]
Potassium	g/m3	0.1	Flame AAS [APHA 3111 B]
Sodium	g/m3	0.1	Flame AAS [APHA 3111 B]
Sulphate	g/m3	0.5	Ion chromatography [APHA 4110 C]
Suspended solids	g/m3	3	Glass fibre filtration, dried at 103°C [APHA 2540 D]
Temperature field	°C	0.5	Portable meter
Turbidity field	NTU	0.1	Nephelometric meter
Turbidity lab	NTU	0.1	Nephelometry APHA 2130 B
Zinc dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Zinc total	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Cation/Anion balance			Calculation
Oil & grease	g/m3	0.2	Partition-infrared method APHA 5520 C
Volatile Acids	g/m3	1	Ion chromatography [APHA 4110 C modified]
Phenols total	g/m3	0.001	Methylene chloride extraction; GC-MS [USEPA 625 modified]
Volatile organics	mg/m3	1	Purge and trap EPA 524.2
Semi-volatile organics	mg/m3	1	Base/neutral/acid extractable organics GC-MS USEPA 625 & 524.2
flow rate field	l/s	0.1	Weir, gauging and direct measurement
Metals digestion			Nitric acid. High pressure microwave. [USEPA method 3015]

Note 1: "Field" means measurement by WM Redvale site staff either at the sample site or in the site laboratory.

Note 2: Dissolved = either field filtered by WM Redvale site staff or filtered by the analytical lab if the sample is delivered in a short time.

* = Measurement required by consent conditions, from Landfill and Managed Fill

** = Analysis not required by consent conditions but required occasionally by WM.

Figure 4.3.3.4

Appendix E Contingency Plan Flow Chart

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REDVALE LANDFILL MANAGEMENT PLAN

Contingency Plan Flowchart

Surface Water and Ground Water

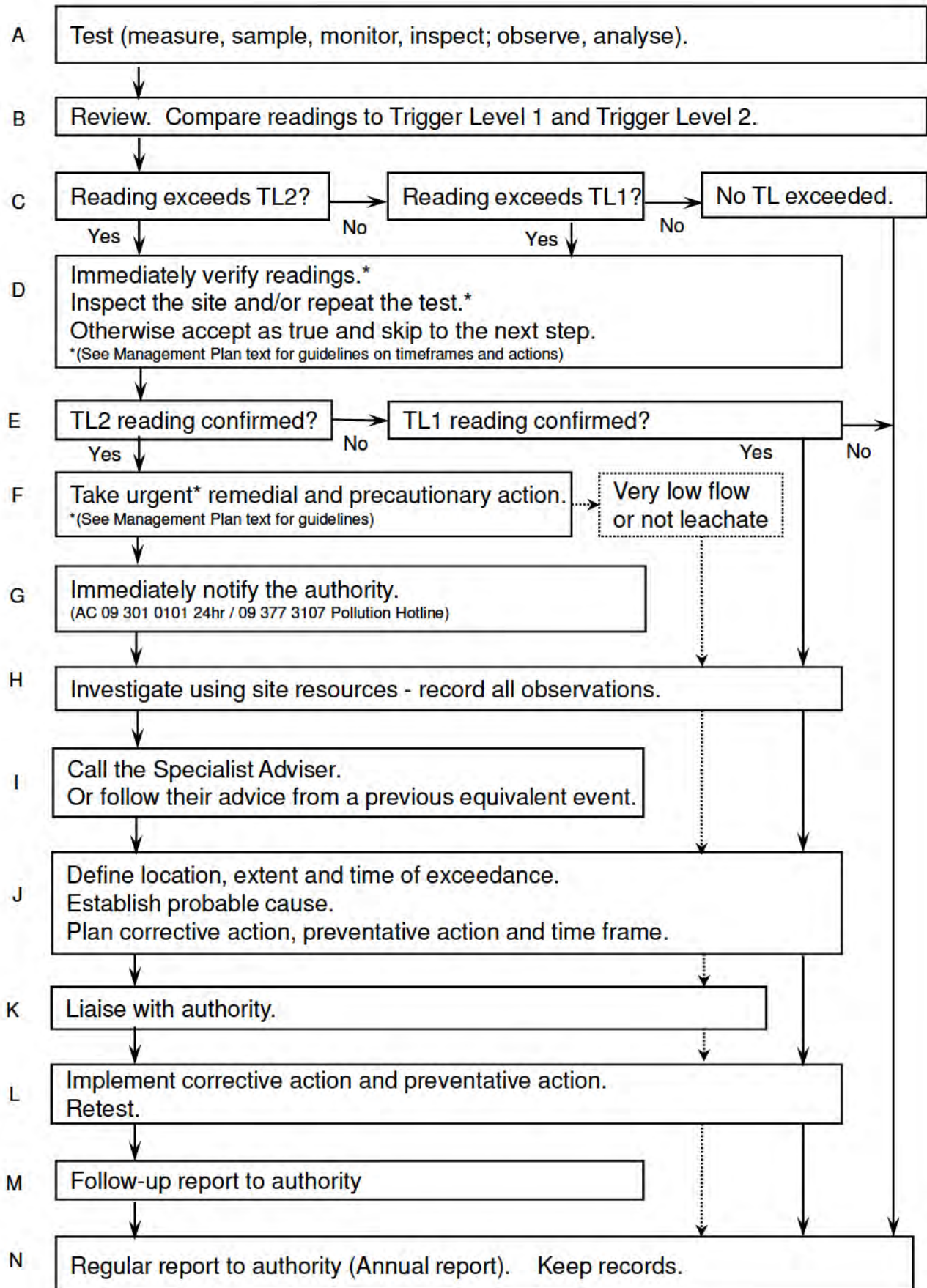


Figure: 4.4.3.1

Contingency Plan Flow Chart Explanation

Line	Action
A	Take surface water samples. The monitoring event may also be making observations that are relevant to water quality but do not necessarily require a test result.
B	Review results. Compare results to trigger levels in this Landfill Management Plan. It is the responsibility of the Landfill Engineer to do this and instigate any actions required by the contingency plan.
C	Determine whether any result is a TL1 or TL2 exceedance.
D	If any TL is exceeded, immediately verify the reading. Either (a) Accept on the spot that the reading is correct i.e. confirmed and proceed to the next step, or (b) Check that the reading is correct by methods such as inspection and retesting provided that this can be done immediately. As a guide, “immediately” means (for surface water): As soon as practical taking into account factors such as safety, daylight, weather intensity, the time it reasonably takes to close a valve, the time it reasonably takes to quickly deploy equipment or machinery to the relevant part of the site, etc. In most cases this would be within ½ hour to ½ day. For ground water: See section 4.5.
E	Confirm whether the TL reading is correct.
F	If TL2 is exceeded, take urgent remedial and precautionary action, and proceed immediately to the next step. As a guide, possible actions are included in the next section.
G	If TL2 is exceeded, notify the authority (Auckland Council), immediately. Ph (09) 301 0101 24hr or (09) 3773107 Pollution Hotline.
H	If TL1 or TL2 is exceeded, investigate using site resources. As a guide, possible actions include (if not already done at Step D): • Check the status of test devices e.g. equipment calibration, equipment state of maintenance, and field or laboratory methods; • Repeat the test; • Inspect the site to confirm other factors such as flow rate, contaminant sources, extent of contamination; • Inspect downstream surface water for ill-effects.
I	Call the Specialist Advisor. Alternatively, take the action recommended by the Specialist Adviser on a previous occasion in which the same exceedance occurred and written advice was obtained.
J	If TL1 or TL2 is exceeded, complete investigations to adequately proceed with the following steps: • define the location, extent, severity, time and growth rate of exceedance and of any contamination; • establish the probable cause; • plan corrective action, preventative action, and time frame, in liaison with AC. As a guide, possible actions are included in the next section.
K	If TL2 is exceeded, liaise with AC in regard to an acceptable action plan.
L	If TL1 or TL2 is exceeded, implement both corrective actions and preventative actions. Then retest any parameter that had a TL2 exceedance.
M	If TL2 is exceeded, and contamination confirmed by the Specialist Adviser, prepare a written report to the AC explaining: • the nature of the contaminant; • the cause of contamination; • remedial actions taken; • preventative actions taken.
N	Report all test results to the AC on an annual basis. Record response actions taken. Keep records on the site for the duration of the landfill operation.

Figure: 4.4.3.1

Appendix F Trigger Levels 1

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SURFACE WATER QUALITY - TRIGGER LEVEL 1

TL1 is exceeded if any one parameter from any one sample from any one site exceeds the value tabulated below.

PARAMETER	UNIT	Pond 1	Pond 2	Pond 3	Pond 4	Stream site #1	Stream site #2	Stream site #3	W/wash holding pond
Flow rate	litres/second	1410	180	1200	600			(Note 1)	
Alkalinity	g/m3 as CaCO ₃	150	150	150	150	no	138	90	
Aluminium diss	g/m3	1.000	1.000	1.000	1	limit	0.33	0.400	
Aluminium total	g/m3					applies			
Ammonia N @pH<8.0	g/m3 as N	0.9	0.9	0.9	0.9	because	0.48	0.9	1.0
Ammonia N @pH>8.0	g/m3 as N	0.2	0.2	0.2	0.2	site #1	0.23	0.2	1.0
Arsenic dissolved	g/m3	0.010	0.010	0.010	0.010	is	0.002	0.010	
BOD5	g/m3					upstream			
Boron	g/m3					from			
Cadmium diss	g/m3	0.001	0.001	0.001	0.001	all	0.00015	0.001	
Calcium	g/m3	(Note 2)	(Note 2)	(Note 2)	(Note 2)	landfill	(Note 2)		
Chloride	g/m3	50	50	50	50	discharges	52	50	
Chromium diss	g/m3	0.010	0.010	0.010	0.010		0.0015	0.010	
COD	g/m3	75	75	75	75		97	75	
Conductivity auto meter	mS/m	75	75	75	106				
Conductivity field	mS/m	(Note 2)	(Note 2)	(Note 2)	(Note 2)		(Note 2)	(Note 2)	(Note 2)
Conductivity lab	mS/m						45	40	100
Copper dissolved	g/m3	0.009	0.009	0.009	0.009		0.0026	0.008	
Hardness	g/m3 as CaCO ₃	200	200	200	200		146	200	
Iron dissolved	g/m3	(Note 2)	(Note 2)	(Note 2)	(Note 2)				
Iron total	g/m3	5.500	5.500	5.500	5.5		3.3	4.000	
Lead dissolved	g/m3	0.005	0.005	0.005	0.005		0.00025	0.005	
Magnesium	g/m3	(Note 2)	(Note 2)	(Note 2)	(Note 2)				
Manganese diss	g/m3	0.600	0.600	0.600	0.600		3.6	0.800	
Nickel dissolved	g/m3	0.020	0.020	0.020	0.020		0.0018	0.010	
Nitrate	g/m3 as N	(Note 2)	(Note 2)	(Note 2)	(Note 2)				
Oxygen diss (min.)	g/m3	(Note 2)	(Note 2)	(Note 2)	(Note 2)		0.28	(Note 2)	
pH upper		8.9	8.9	8.9	8.9		7.8	7.7	9.0
pH lower		6.5	6.5	6.5	6.5		6.5	6.7	6.5
Phosphorus total	g/m3								
Potassium	g/m3	9	9	9	9		10	6.9	
Sodium	g/m3	200	200	200	200		32	200	
Sulphate	g/m3	200	200	200	200		62	80	
Suspended solids	g/m3	50	50	50	50		79	50	200
Temperature field	°C	28	28	28	28		25	24	31
Turbidity auto meter	NTU	60 ⁽⁸⁾	60 ⁽⁸⁾	60 ⁽⁸⁾	60 ⁽⁸⁾				
Turbidity lab	NTU						57	80	
Zinc dissolved	g/m3	0.110	0.110	0.110	0.110		0.0061	0.040	
Zinc total	g/m3	(Note 2)	(Note 2)	(Note 2)	(Note 2)				(Note 2)
Cation/Anion balance		(Note 2)	(Note 2)	(Note 2)	(Note 2)				
Oil & grease	g/m3								4
Volatile Acids	g/m3	25	25	25	25		11	12	
Phenols total	g/m3	0.015	0.015	0.015	0.015		0.011	0.010	
Volatile organics	mg/m3								
Semi-volatile organics	mg/m3								
Ponds 1 - 4 abstraction	m3/day								

Note 1: Monitored either continuously, fortnightly, two-monthly or yearly, but no response limit applies.

Note 2: Analysis not required by consents but performed at discretion of site management.

Note 3: Response actions are described in the LMP text.

Appendix G Trigger Levels 2

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SURFACE WATER QUALITY - TRIGGER LEVEL 2

TL2 is exceeded if any one parameter from any one sample from any one site exceeds the value tabulated below.

PARAMETER	UNIT	Pond 1	Pond 2	Pond 3	Pond 4	Stream site #1	Stream site #2	Stream site #3	W/wash holding pond
Flow rate	litres/second	1410	180	1200	600			(Note 1)	
Alkalinity	g/m3 as CaCO ₃	200	200	200	200	no	200	200	
Aluminium diss	g/m3	2.000	2.000	2.000	2.000	limit	2	2.000	
Aluminium total	g/m3					applies			
Ammonia N @pH<8.0	g/m3 as N	0.9	0.9	0.9	0.9	because	0.9	0.9	2.0
Ammonia N @pH>8.0	g/m3 as N	0.2	0.2	0.2	0.2	site #1	0.2	0.2	2.0
Arsenic dissolved	g/m3	0.050	0.050	0.050	0.050	is	0.002	0.050	
BOD5	g/m3					upstream			
Boron	g/m3					from			
Cadmium diss	g/m3	0.003	0.003	0.003	1.003	all	0.03	0.003	
Calcium	g/m3	(Note 2)	(Note 2)	(Note 2)	(Note 2)	landfill			
Chloride	g/m3	100	100	100	100	discharges	100	100	
Chromium diss	g/m3	0.020	0.020	0.020	0.020		0.02	0.020	
COD	g/m3	150	150	150	150		150	150	
Conductivity auto meter	mS/m	150	150	150	150				
Conductivity field	mS/m	(Note 2)	(Note 2)	(Note 2)	(Note 2)		(Note 2)	(Note 2)	(Note 2)
Conductivity lab	mS/m						150	150	200
Copper dissolved	g/m3	0.050	0.050	0.050	0.050		0.05	0.050	
Hardness	g/m3 as CaCO ₃	500	500	500	500		500	500	
Iron dissolved	g/m3	(Note 2)	(Note 2)	(Note 2)	(Note 2)		(Note 2)		
Iron total	g/m3	7.000	7.000	7.000	8.000		7	7.000	
Lead dissolved	g/m3	0.050	0.050	0.050	1.050		0.05	0.050	
Magnesium	g/m3	(Note 2)	(Note 2)	(Note 2)	(Note 2)				
Manganese diss	g/m3	5.000	5.000	5.000	5.000		5	5.000	
Nickel dissolved	g/m3	0.160	0.160	0.160	0.160		0.16	0.160	
Nitrate	g/m3 as N	(Note 2)	(Note 2)	(Note 2)	(Note 2)				
Oxygen diss (min.)	g/m3	(Note 2)	(Note 2)	(Note 2)	(Note 2)		(Note 2)	(Note 2)	
pH upper		9	9	9	9		9	9.0	9.1
pH lower		6.4	6.4	6.4	6.4		6.4	6.4	6.3
Phosphorus total	g/m3								
Potassium	g/m3	15	15	15	15		15	15	
Sodium	g/m3	300	300	300	300		300	300	
Sulphate	g/m3	400	400	400	400		400	400	
Suspended solids	g/m3	100	100	100	100		100	100	400
Temperature field	°C	31	31	31	31		31	31	32
Turbidity auto meter	NTU	200	200	200	200				
Turbidity lab	NTU						200	200	
Zinc dissolved	g/m3	0.110	0.110	0.110	0.110		0.11	0.110	
Zinc total	g/m3	(Note 2)	(Note 2)	(Note 2)	(Note 2)				(Note 2)
Cation/Anion balance		(Note 2)	(Note 2)	(Note 2)	(Note 2)				
Oil & grease	g/m3								10
Volatile Acids	g/m3	100	100	100	100		100	100	
Phenols total	g/m3	0.100	0.100	0.100	0.100		0.1	0.100	
Volatile organics	mg/m3								
Semi-volatile organics	mg/m3								
Ponds 1 - 4 abstraction	m3/day	200							

Note 1: Monitored either continuously, fortnightly, two-monthly or yearly, but no response limit applies.

Note 2: Analysis not required by consents but performed at discretion of site management.

Note 3: Response actions are described in the LMP text.

3.20 Groundwater

3.20.1 Consent requirements

[Condition XX]

3.20.2 Groundwater system

3.20.2.1 Site Geology

The landfill was established in areas predominantly underlain by Northern Allochthon. The Northern Allochthon units below Redvale Landfill comprise Mahurangi Limestone and Hukerenui Mudstone. To the south-west of the landfill site are areas comprised of East Coast Bays Formation Siltstones and Sandstones which are part of the Waitemata Group.

3.20.2.2 Hydrogeology

The hydrogeology of the site is described in the Hydrogeology Assessment prepared by Leon Pemberton, from Tonkin and Taylor, submitted with the substantive application under the FTAA.

The groundwater system within and wider from Redvale Landfill is unconfined and is hydraulically connected to the Rangitōpuni Waitemata sub-aquifer zone, as identified on Auckland Council GeoMaps and utilised as a groundwater catchment for allocation purposes.

The hydraulic conductivities beneath the existing landfill are low (ranging between 3×10^{-8} m/s for limestone to $<5 \times 10^{-10}$ m/s for mudstone), with groundwater flow rates considered to be slow. The Class 2 footprint extension area is within the Northern Allochthon mudstone and therefore has a representative hydraulic conductivity of $<5 \times 10^{-10}$ m/s with groundwater flowing from higher ground in the northwest towards the southeast, including the existing Sediment Pond 6.

3.20.2.3 Groundwater levels

A monitoring well was drilled in 2024 in the vicinity of the Class 2 extension. Monitoring within this monitoring well over the 2024/2025 period demonstrated the lowest groundwater level as 5.64 m bgl in April 2025 and the highest groundwater level of 4.69 in December 2024.

3.20.2.4 Groundwater quality

The ground water may be described generally as alkaline, containing sodium bicarbonate and having moderate salinity. Occasional high levels of iron, phosphate, aluminium and magnesium have been measured.

Notwithstanding the inward gradient, ground water quality monitoring wells will be maintained and sampled around the full perimeter of the site to detect leachate contamination, if any. The low yield of the wells will limit sampling to quarterly.

3.20.2.5 Groundwater and leachate quality results show no evidence of significant change over time. Baseline monitoring

For the existing Class 1 landfill, the results of baseline monitoring are described in the following documents:

- Evidence presented to the Planning Tribunal¹²

¹² Russell, Wayne; November 1991: Evidence presented to the Planning Tribunal on behalf of Waste Management NZ Ltd, Volume 2.

- Letter from Woodward-Clyde¹³
- Letter from URS New Zealand Limited¹⁴

A number of boreholes will undergo a baseline monitoring programme in the vicinity of the Class 2 extension area. The boreholes used for baseline monitoring and those for ongoing monitoring for the Class 2 extension area are listed in Section 3.20 Appendix B.

A summary of the findings of this baseline monitoring will be provided once complete.

The dataset obtained from baseline monitoring of the Class 2 extension area will be used to develop trigger levels for this area. Baseline sampling will comprise at least 10 monitoring rounds prior to waste placement in the Class 2 extension area, at intervals of no less than monthly and no more than quarterly [Condition XX].

3.20.3 Groundwater monitoring plan

3.20.3.1 Objectives

The objective of the groundwater monitoring plan is to:

- a) Comply with the monitoring programme specified in the consents
- b) Provide data to continually confirm hydrogeological assumption
- c) Provide data to identify circumstances when contingency responses should be enacted

3.20.3.2 Piezometers

Piezometers will be installed and maintained in operating condition to measure the ground water level outside the perimeter of the landfill footprint. The specific piezometers installed will be detailed in Schedule One to the consent conditions.

The aim of piezometric monitoring will be to confirm that the elevation of the surrounding ground water is higher than the elevation of the leachate within the landfill, thereby verifying the design assumption of inward gradient.

The design features will be:

- Measure pressure changes in materials of low permeability
- Measure pressures at two depths at each location
- Install 12 months before adjacent landfilling.

As at 2026, WL1 to WL8 and WL10 are in place. Replacements had been made periodically due to malfunctioning in-hole equipment or advancing construction works. Pneumatic piezometer instruments were in use, which required connection of a compressed air source and a “read-out” controller unit to take each reading. During October 2024 an additional 4 groundwater level monitoring boreholes were drilled (3 on the southern side of the Phase 10 Bund, 1 borehole was drilled south-east of the Managed Fill), and a total of 6 vibrating wire piezometers (VWP, shallow and deep) were installed and commenced being monitored. Bore permits were obtained from AC and where required borelogs submitted for each borehole installation.

The methods of installation and measurement will be as specified by the instrument manufacturer. Monitoring will be conducted quarterly. Due to the low yield of the wells associated with the low permeability of the aquifer, the wells will not be purged at least 7 days before measuring the levels.

¹³ Woodward-Clyde; 15/8/95: Redvale Landfill - ground water, letter to Redvale Landfill, ref wjr2450.22.

¹⁴ URS New Zealand Limited, April 2005: Redvale landfill-Trigger Level Exceedances in Groundwater from wells M1A, M2B and M7A, Project No: 48215-006-0100.

3.20.3.3 Observation wells

The site has a number of groundwater level observation wells around the perimeter of the landfill (Section 3.20 Appendix A). These wells will be monitored quarterly. Wells used for ground water sampling will be excluded to avoid potential cross-contamination from the dip meter probe.

3.20.3.4 Sampling wells

Sampling wells will be installed and maintained in good condition to take samples for water quality analyses outside the perimeter of the landfill footprint. There will be a number of wells as listed in Schedule One of the consent conditions and installed at the locations shown in Section 3.20 Appendix A. A typical design detail is presented in Section 3.20 Appendix C.

The aim of sampling will be to detect any changes to the ground water quality which indicates contamination.

The design features will be:

- drilled to 3 m below adjacent base grade floor level
- screened into all depths except uppermost 2.5 m to make a surface seal
- use of safe drilling methods and selected cleaned materials to avoid any contamination during installation
- locked protective surface casing
- installed 12 months before adjacent landfilling
- dedicated well pumps to avoid cross-contamination associated with moving pumps between holes

Ground water samples will be analysed for the parameters listed in Section 3.20 Appendix D.

The company has maintained a site laboratory which owned, maintained, calibrated and operated the equipment for the field work associated with taking samples. Samples are sent to an independent laboratory for analyses.

Site management will maintain written procedures for the taking of samples and use of field equipment. The procedures for groundwater sampling have been outlined in Section 3.20 Appendix E. The methods of chemical analyses, units of measurement, and detection limits will be as specified in Section 3.20 Appendix F, except improved methods may be used at any time followed within 12 months by updating this plan.

Sampling will be conducted quarterly, commencing at least 12 months before refuse placement in the adjacent part of the landfill. Due to the low yield of the wells associated with the low permeability of the aquifer, and the aim to obtain sufficient water for proper laboratory analyses, purging before sampling will be different from common practices and will comprise removal of “one well volume” of water 7 to 10 days before sampling.

It will be the responsibility of the Landfill Engineer or its nominee to ensure that samples are taken properly, that only a competent independent laboratory will analyse the samples, that records will be collated and evaluated, and that records will be sent to AC.

3.20.3.5 Routine Evaluation of Results

Upon receipt of results, they will be compared to response limits as described in the Contingency Plan, and the appropriate action will be taken.

3.20.3.6 Reporting and Record Keeping

Results from field testing and from the laboratories will be collated in electronic computer tables, as either spreadsheets or databases. Records will be maintained for the operating life of the landfill, or longer if specified in the post-closure management plan.

Monitoring Items	Reporting
Ground water quality analyses results	Quarterly report to AC
Ground water levels	Quarterly report to AC
Leachate levels	Quarterly report to AC
All above information	Regular monthly report to PRP

A copy of each letter of transmittal of results sent quarterly to the AC will be sent to the PRP to show that all monitoring results have been forwarded to the AC. The record of the quarterly groundwater monitoring levels, for each bores listed in Section 3.20 Appendix B and Appendix A, shall be submitted to AC no later than April 30 each year, including the information since the installation of the bore until the quarter ending 31 March.

3.20.4 Groundwater contingency plan

3.20.4.1 Trigger levels

Response limits (or trigger levels) are values for the monitored parameters which, if exceeded, require a course of action to be taken. Upon completion of a monitoring event, the results will be checked against the pre-specified response limits. If no response limit is exceeded, the monitoring event will be routinely reported to the authority in due course. If any response limit is exceeded, action will be taken immediately as described in this contingency plan. The response procedures are summarised in Section 3.20 Appendix J. The limits are set at two levels:

Trigger Level 1 (Lower response limit)

Exceedance of TL1 warns of potential adverse effects, warns of potential future non-compliance with the resource consent conditions, requires investigation and reporting, and might require remedial action. For ground water, TL1 requires any one individual parameter to exceed the listed limit.

Trigger Level 2 (Upper response limit)

Exceedance of TL2 will be regarded as evidence that significant environmental harm and breaches of consent conditions either have occurred, are currently occurring, or are about to occur. The upper limit will be set either at the limit specified in the resource consent if there is one, or at a limit which if exceeded indicates non-compliance, or at a limit which would require the specialist adviser to be called on average once every 3 years. It usually requires urgent mitigative actions, notification of authorities, calling of the specialist adviser, and prompt investigations and remedies. For ground water, TL2 requires any one individual parameter to exceed the listed limit.

3.20.4.2 Class 1 Trigger levels

The trigger levels have been set for all the operational monitoring wells for the Class 1 landfill shown in Section 3.20 Appendix B.

The trigger levels were set on the basis of baseline monitoring results and the guideline values for the protection of 95% of the freshwater species or any other standard guideline values approved in written by AC.

The response limits for groundwater quality are shown in Section 3.20 Appendix G (TL1) and Appendix H (TL2).

The contingency plan for ground water is shown in Section 3.20 Appendix I.

3.20.4.3 Class 2 trigger levels

Trigger levels have not been set for the Class 2 extension and will be developed from the baseline dataset and cross-checked against appropriate guideline values (e.g., ANZG 95% species protection) consistent with the LMP's historical approach.

The derivation approach to trigger levels is described as follows:

- Well-specific statistics using recognised methods for groundwater datasets (e.g., mean/ variance-based thresholds accounting for seasonal variability) using the Class 2 baseline series.
- Guideline check: Where appropriate, compare to guideline thresholds (e.g., where variability is small or background exceeds guidelines, adopt the more protective level consistent with the LMP practice).
- Review trigger levels annually and update as the dataset grows.

3.20.4.4 Leachate contamination

"Leachate contamination", "contamination" and "contaminant ... discharge to water" are defined for the purposes of [Condition XX] as circumstances meeting any one or more of:

- TL2 exceeded, and
- Specialist Adviser has confirmed that a change has occurred to water quality due to leachate and that the change has been significant.

3.20.4.5 Specialist Adviser

WMNZ will consult a specialist adviser as required. The specialist adviser person may be either a specialist staff member of the company or an external consultant having relevant experience.

The following specialist adviser has most recently provided written advice on groundwater:
Leon Pemberton

Tonkin & Taylor Ltd

3.20.4.6 Reporting

Potential contamination event	Reporting
(a) No TL exceeded.	Routine annual report to AC.
(b) TL1 exceeded.	Routine annual report to AC.
(c) TL2 exceeded.	Notify AC immediately. Liaison regarding corrective actions.

Redvale Landfill Management Plan

(d) Specialist Adviser has confirmed that a change has occurred to ground water quality due to leachate and that the change has been significant.	Report to AC in compliance with 95. Separate event follow-up report.
(e) All events.	Routine monthly report to the PRP Copy to PRP of annual report to AC.

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Appendix A Environmental Monitoring borehole locations plan

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Notes:



Issue	Description	approved	Date



Operational and Technical Services
Landfill Access Road,
RD 4, Albany 0794, Auckland
Ph +64 (09) 427 0600
www.wastemanagement.co.nz

Name	Date
Surveyed:	
Designed:	
Drawn:	03 16/02/17
Checked:	
Scale:	@A3: 1:4300
Project:	

REDVALE LANDFILL MONITORING LOCATIONS 2019

Issued for:

Drawing Number:



Appendix B Schedule 1 Monitoring boreholes at Redvale Landfill

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Schedule 1
Monitoring Boreholes

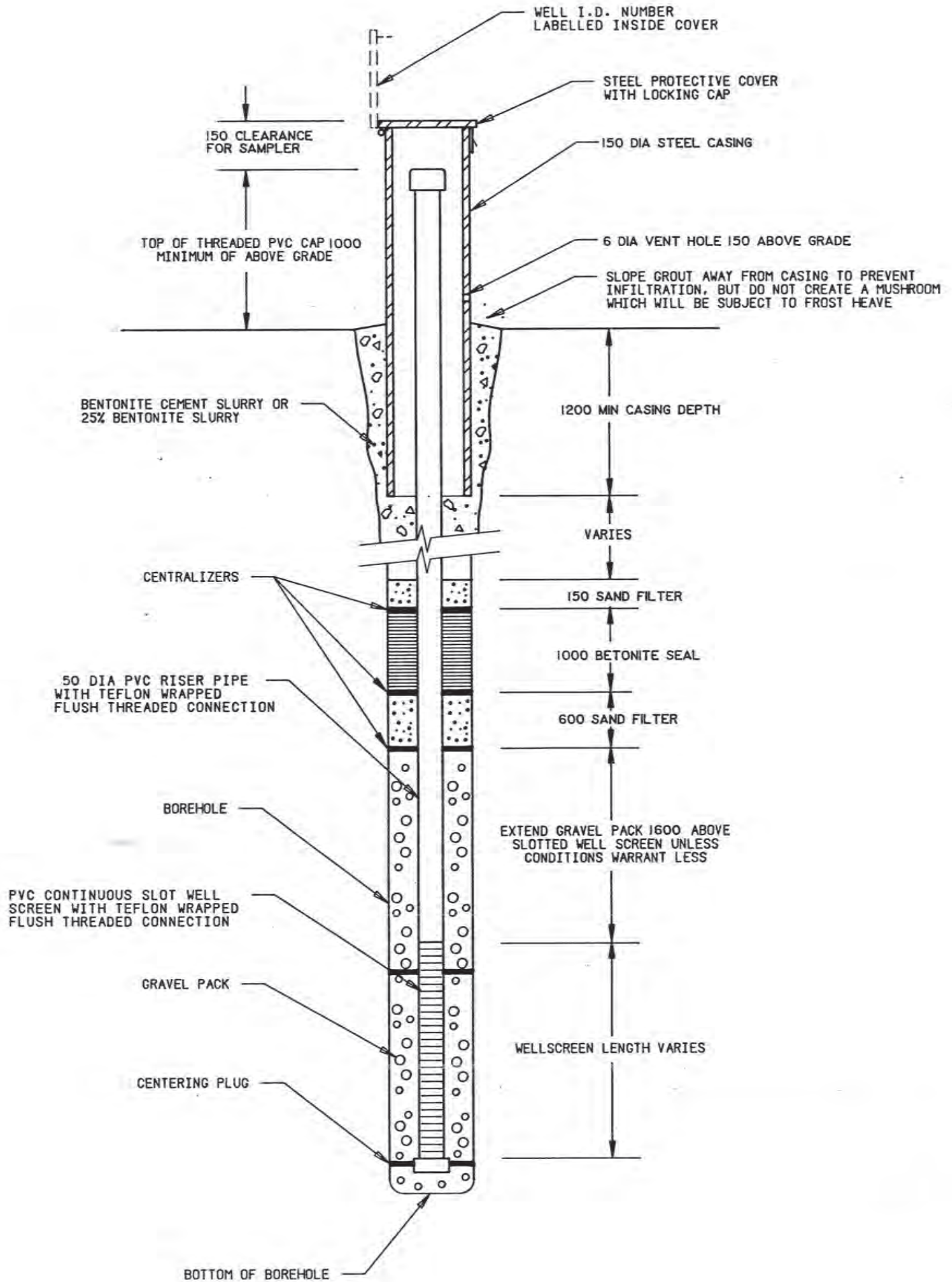
Site Bore Name	Comment	AC Bore ID	Water Levels	Water Quality	Ground Elevation (mRL)	Elevation at top of casing	Easting (NZTM)	Northing (NZTM)	Casing Depth	Borehole Depth
M1A			yes	Yes	67.77	68.41	1745359	5942032		15.00
M2B			yes	Yes	71.85	72.50	1745776	5941876		31.20
M7A			yes	Yes	55.16	56.15	1745818	5941051		16.70
M8A			yes	Yes	54.94	55.90	1745983	5941328		16.80
M9A			yes	Yes	57.00	57.88	1745058	5941580		16.53
M10A			yes	Yes	59.14	60.14	1746111	5941785		16.74
M11IA			yes	Yes	64.21	65.01	1745210	5942013		15.00
M12A			yes	Yes	67.04	67.84	1745076	5941966		15.00
M13A			yes	Yes	74.13	73.64	1744864	5941894		12.50
WM1B			yes	Yes	63.60	64.36	1745481	5941150		24.60
PZ44(S) [VWP]	Shallow		yes		78.38	n/a	1745261	5941323		7.10
PZ45(D) [VWP]	Deep		yes		78.38	n/a	1745261	5941323		15.50
WL2S	Shallow		yes		62.10	n/a	1745602	5941134		7.50
WL2D	Deep		yes		62.10	n/a	1745602	5941134		18.00
WL3S1	Shallow		yes		51.24	n/a	1745871	5941166		6.01
WL3D1	Deep		yes		51.33	n/a	1745871	5941172		13.41
WL4S	Shallow		yes		56.66	n/a	1746010	5941390		3.05
WL4D	Deep		yes		56.66	n/a	1746010	5941390		9.10
WL5S	Shallow		yes		60.18	n/a	1746083	5941673		1.45
WL5D	Deep		yes		60.18	n/a	1746083	5941673		5.90
WL6SA	Shallow		yes		71.72	n/a	1745776	5941878		12.40
WL6DA	Deep		yes		71.55	n/a	1745776	5941880		27.20
WL7S	Shallow		yes		78.57	n/a	1745471	5942022		11.94
PZ42(D) [VWP]	Deep		yes		78.45	n/a	1745289	5941934		15.50

Site Bore Name	Comment	AC Bore ID	Water Levels	Water Quality	Ground Elevation (mRL)	Elevation at top of casing	Easting (NZTM)	Northing (NZTM)	Casing Depth	Borehole Depth
WL8S	Shallow		yes		65.39	n/a	1745264	5942030		9.00
WL8D	Deep		yes		65.43	n/a	1745267	5942031		16.00
WL9S	Shallow		yes		75.69	76.10	1744853	5941868		25.00
WL9D	Deep		yes		75.69	76.10	1744853	5941868		46.00
WL10S	Shallow		yes		82.32	82.77	1744802	5941744		9.00
WL10D	Deep		yes		82.32	82.77	1744802	5941744		21.50
LM1A			Yes - leachate level		59.17	59.99 (riser)	1745840	5941254		15.00

Figure: 4.5.5.2

Appendix C Groundwater monitoring well typical design

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Appendix D Groundwater quality analysis parameter lists

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REDDALE LANDFILL

WATER QUALITY ANALYSIS PARAMETER LISTS



	LIST> WHEN>	A Before discharge	B 14 days	N Monthly	C 3 months	E 3 months	O 3 months	F high outlet conductivity	K 3 months (1st year only)	H 6 months	P 6 monthly	HP 6 monthly	L 1 year
	TYPE>	Wheel wash holding pond	Pond discharge	Pond discharge (or pond)	Pond discharge & Stream Sites	Ground water wells	Pond discharge (or pond)	Pond discharge	Ground water wells	Pond discharge & Stream Sites	Stream	Stream	Ground water wells
	FROM>	1 w/w pond	Ponds 1 to 4	Pond 6	Ponds 1 to 4 & Stream Sites 1 to 3	WM1B, M7A, M8A, M9A, M10A, M2B, M1A, M11A	Pond 6	Ponds 1 to 4	WM1B, M7A, M8A, M9A, M10A, M2B, M1A, M11A	Ponds 1 to 4 & Stream Sites 1 to 3	Rangitopuni Stream Sites 2, 3, 4	Rangitopuni Stream Sites 2, 3, 4	WM1B, M7A, M8A, M9A, M10A, M2B, M1A, M11A
	CONSENT>	REG-61342 (NRSI- 42570)	REG-61342 (NRSI- 42570)	39714	REG-61342 (NRSI- 42570)	REG-61341 (NRSI- 42369)	39714	REG-61342 (NRSI- 42570)	REG-61341 (NRSI- 42369)	REG-61342 (NRSI- 42570)	39714	39714	REG-61341 (NRSI- 42369)
	CONDITION>	143 [q]	143 [d]	57	121, 143[e]	87	57	117	84	121, 143 [e]	59	59	88
Alkalinity			*		*				*	*		*	*
Aluminium dissolved					**	**			**	**		**	**
Aluminium total													
Ammonia N total		*	*	*	*	*	*	*	*	*	*	*	*
Arsenic dissolved					**		*		*	**	*	*	*
BOD5													*
Boron						*			*				*
Cadmium dissolved					*		*		*	*	*	*	*
Calcium					**				*	*			*
Chloride			*		*	*		*	*	*		*	*
Chromium dissolved					*		*		*	*	*	*	*
COD			*		*			*	*	*	*	*	*
Conductivity field		**	**	*	**	**		**	**	**	*	*	**
Conductivity lab		*	*	*	**	*	*	*	*	**	*	*	*
Copper dissolved					*		*		*	*	*	*	*
Hardness					*			**	*	*		*	*
Iron dissolved					**		*		*	**		*	**
Iron total					*				*	*		*	
Lead dissolved					*		*		*	*	*	*	*
Magnesium					**				*	**		*	*
Manganese dissolved					**		*		*	**		*	*
Nickel dissolved					*		*		*	*	*	*	*
Nitrate N					**	*			*	**		*	*
Oxygen diss. field			**	*	*		*	**	*	*	*	*	*
pH field		**	**	*	**	**	*	**	**	**	*	*	**
pH lab		*	*		**	*		*	*	**		*	**
Phosphorus total									**				**
Potassium					**				*	**		*	*
Sodium					**				*	**		*	*
Sulphate					**				*	**		*	*
Suspended solids		*	*		*				*	*	*	*	*
Temperature field		*	*	*	*	*	*	*	*	*	*	*	*
Turbidity field						**						*	**
Turbidity lab				*	*	*	*	*	*	*	*	*	*
Zinc dissolved					*		*	**	*	*	*	*	*
Zinc total		**			*				*	*		*	
Cation/Anion balance					**				*	**		*	*
Oil & grease		*			*				*	*		*	*
Volatile Acids						*		*	**	*		*	**
Phenols total								*	**	*		*	*
Volatile organics												*	*
Semi-volatile organics												*	*
Flow rate field estimate				*			*			*	*	*	*
Total Petroleum Hydrocarbons (TPH)					**		*			**		*	*
Organochlorine Pesticides (OCP including DDT compounds)							*			*	*	*	*
Polycyclic Aromatic Hydrocarbons (PAH)							*			*	*	*	*
Water depth										*	*	*	*
Results required by		1 week	1 week		2 weeks	2 weeks		1 week	3 weeks	2 weeks		3 weeks	3 weeks
Note 1: "Field" means measurement by TWM Redvale site staff either at the sample site or in the site laboratory.													
Note 2: Dissolved = either field filtered by TWM Redvale site staff or filtered by the analytical lab if the sample is delivered in a short time.													
* = Measurement required by consent conditions, from Landfill and Managed Fill													
** = Analysis not required by consent conditions but required occasionally by TWM.													

Figure: 4.5.5.4

Appendix E Groundwater sampling procedure

DRAFT

WORK INSTRUCTION FORM

HSEQ Management System



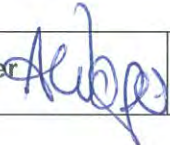
Date:	14/12/2016			Risk Assessment No:	
Division:	Waste Management NZ	Branch/Site:	Redvale Landfill		
Task Location:	Redvale Landfill	Work Activity:	Ground Water Sampling		
Permits / Authorisations required:	WORK PERMIT ☐ BREAKTHROUGH ☐ CONFINED SPACE ☐ HOT WORK ☐ FALL PREVENTION ☐				
Work Instruction undertaken by:	Daya Gautam	Position Title:	Environmental Engineer	Date:	14/12/2016
Comments					
First Stage Approval:	Andy Vosper 	Position Title:	Regional Manager	Date:	14/12/2016
Comments					
Final Approval:	Andrew Burt	Position Title:	HSE Advisor	Date:	
Comments:					

FIGURE 4.5.5.5

WORK INSTRUCTION FORM

HSEQ Management System



REQUIRED EQUIPMENT	
PPE Required: Helmet, High -Vis Clothing, Boots, Gloves.	Additional equipment/Tools: - Environmental Monitoring Sample Register - "Well Wizard" pneumatic controller. - Compressed air (dive tank) bottle. - Pressure regulator (120 psi) for the air bottles (currently permanently connected to red air hose #1 - Air hose #1 for supply from regulator to controller - Air hose #2 for supply from controller to dedicated well pump - Portable pH meter - Portable conductivity meter with thermometer - Sample bottles supplied by the analytical laboratory which will perform the analyse - Powderless disposable gloves - Groundwater Sampling Field Sheets - Cold storage bin - Frozen ice bricks
REQUIRED LICENCES & COMPETENCIES	
Licences:	Competencies:

FIGURE 4.5.5.5

WORK INSTRUCTION FORM

HSEQ Management System



LEGISLATIVE REFERENCES (Optional)			
WORK INSTRUCTION			
Task	Steps (This includes what to do and related control measures)	Key Points	Responsible person (optional column)
Introduction	Groundwater at Redvale Landfill is regularly sampled by Redvale Personnel and subsequently analysed by an independent laboratory. The testing is required to comply with resource consents. This Work Instruction covers the apparatus, methods and documentation associated with groundwater sampling at Redvale. The wells should have been purged sometime in the previous 10 days, and the purge data recorded on the relevant Daily Monitoring Field Sheet. Purging is needed to remove any stagnant water from the wells. This is important because the stagnant water removed may not reflect the actual chemistry of the groundwater at the location.	Purge all wells before sampling.	Lab Technician

FIGURE 4.5.5.5

WORK INSTRUCTION FORM

HSEQ Management System



Ordering Sample Bottles	Sample bottles should arrive from the analytical laboratory at least one week before needed for sampling, this occurs automatically from the Sampling Schedule which is sent to the analytical lab at the beginning of each calendar year.	Check lab sampling schedule calendar in office to ensure that all correct sampling bottles have been sent.	Lab Technician
Preparing for Sampling	Ensure ice bricks are in the freezer on the night before sampling. Ensure the portable field meters are correctly calibrated. Place sample bottles in a chilly bin with ice bricks after writing on the sample numbers and date (See next section), immediately prior to sampling.		Lab Technician
Documentation	Obtain sample bottle sets. Obtain the Environmental Monitoring Sample Register and enter the details of each bottle in each sample set. Keep to the sequence used previously for this analysis (eg List L), so that the computer system (Excel) does its automatic updates correctly in subsequent steps. Complete the following fields for each sample bottle, in the Environmental Monitoring Sample Register: Date date of sampling, not document preparation. Location actual sample location. Bottle eg. 100/P/P/F/C = 100ml/ Plastic/ Preserved/ Filtered/Chilled. Analyte eg. List E. Lab eg. Hill's Disposal eg. Hill's.Chain of Custody. Copy the WM sample numbers onto the correct bottles using an indelible waterproof pen, along with any other information (eg date) required by the independent lab.	Carefully document and record sampling bottles: when, where, by who. 	Lab Technician
Chain of Custody	The Chain of Custody forms are set up in Excel on the computer (in, for example: spreadsheet "COCs Hills.xls").		Lab Technician

FIGURE 4.5.5.5

WORK INSTRUCTION FORM

HSEQ Management System



	Open the workbook. Open the correct COC worksheet for the Samples in question (eg List L). Enter (or change) the fields in blue only. These are: Date, Purchase Order Number, Sampler, and the first WMNZ bottle number of the first set from the Register. The system will then fill in all consecutive numbers on the COC form. Check these match those in the Sample Register. Save and print the COC form.		
Creating Field Sheets	Open the Groundwater Field Sheets workbook (formgroundwater.xls) in Excel and reply "yes" to the "Update?" question. This automatically updates the relevant fields on the appropriate worksheets. Check that the WMNZ Sample Numbers now match those in the Sample Register. Open the first sheet in the workbook for the List in question. eg "List E M7A". The only field requiring update (in blue) should be the "Turbidity Sample #". The system will automatically update the Turbidity Sample Numbers on all the remaining worksheets. Check that these now match the Sample Register. Save and print the Field Sheets. Using the previously recorded purge data from the relevant Daily Monitoring Field Sheet, write in the volume purged and the purge date on each Field Sheet, for each of the wells to be sampled	Field sheets and chain of custody form completed on excel spreadsheet.	Lab Technician

FIGURE 4.5.5.5

WORK INSTRUCTION FORM

HSEQ Management System

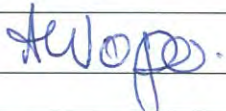
Taking the Samples	Transport the equipment to each well in turn, and follow the procedure below at each one: Put on disposable gloves. Connect the 2 hoses to the Well Wizard's inlet and outlet. Remove the steel Well Cap and uncoil the discharge tube from inside. Remove the small dust/insect protection cap from the end of the tube and put in a clean place. Connect the pressure hose to the fitting on the top of the well tube cap. Connect the remaining pressure hose end to the Air Tank. Slowly turn on the air supply tap on the Air Tank. Adjust the controls on the Well Wizard to obtain a suitable flow at suitable intervals. Allow the cycle to run through repeatedly until between 1.5 and 2.5 litres of water has been purged (assuming that the well was purged within last 10 days). Fill all the bottles in the sample set for the current Well, as well as an inhouse sample bottle for turbidity, pH, temperature and conductivity. Close the Air Tank tap and disconnect all hoses and replace in carry bucket. Replace well caps. Place the sample bottles back in the chilly bin. Measure pH, temperature and conductivity from inhouse sample bottle. Record sampling time, weather conditions, volume purged, clarity, colour, odour and sheen, and any other comments, onto the field sheet for the Well sampled.	Ensure that there is no cross contamination during sampling by following best sampling practises. 	Lab Technician
---------------------------	---	--	-----------------------

FIGURE 4.5.5.5

WORK INSTRUCTION FORM

HSEQ Management System

Dispatching the Samples	Complete Purchase Order Form including the following details: Description of required analysis or refer to the COC Number. Approximate cost. Cost coding or reference, eg. Surface water sampling. Cross through unused lines and get supervisor to sign purchase order. Remove white copy from purchase order book and attach to C.O.C. Transfer samples from WM chilly bin Into Independent lab chilly bin. Add one to three ice bricks and packing material as appropriate. Included C.O.C and purchase order with samples to be delivered to the analytical laboratory. Seal and address chilly bin, stick on Courier label and place in front office before 15:30 ready for collection.		Lab Technician
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Prepared in consultation with:	Jourdan Alexander
Approved by:	Andy Vosper
Signature:	

I have read and understood the attached Work Instruction (<i>Enter name and sign</i>)			
Operators Name:		Operators Signature:	
Operators Name:		Operators Signature:	
Operators Name:		Operators Signature:	

FIGURE 4.5.5.5

WORK INSTRUCTION FORM

HSEQ Management System



Office use only: (the section below to be completed by Supervisor)

PERMIT TO WORK	☐ Yes ☐ No	WORK INSTRUCTION	☐ Yes ☐ No	AUTHORITIES REQUIRED:	☐ Yes ☐ No	(Tick below)
BREAKTHROUGH	☐ Yes ☐ No	CONFINED SPACE	☐ Yes ☐ No	HOT WORK	☐ Yes ☐ No	FALL PREVENTION ☐ Yes ☐ No
Supervisor name:		Supervisor Signature:			Date: / /	

FIGURE 4.5.5.5

Appendix F Water quality analysis parameter test methods and detection limits

DRAFT

WATER QUALITY ANALYSIS PARAMETER TEST METHODS

PARAMETER	UNIT	Detection Limit	Method
Alkalinity	g/m3 as CaCO ₃	1	Titration APHA 2320 B
Aluminium dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B].
Aluminium total	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B].
Ammonia N total	g/m3 as N	0.005	Automated phenate spectrophotometry [APHA 4500-NH ₃ G
Arsenic dissolved	mg/m3	1	Continuous flow hydride generation AAS [APHA 3114 C]
BOD ₅	g/m3	0.1	Membrane electrode APHA 5210 B
Boron	mg/m3	5	Azomethine H Spectrophotometry CSTPA
Cadmium dissolved	mg/m3	0.05	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B].
Calcium	g/m3	0.1	Flame AAS [APHA 3111 B]
Chloride	g/m3	0.5	Ion chromatography [APHA 4110 C]
Chromium dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Chemical Oxygen Demand, COD	g/m3	1	Closed reflux colorimetric method [APHA 5220 D Hach]
Conductivity field	mS/m	0.1	Portable meter
Conductivity lab	mS/m	0.1	Meter APHA 2510 B
Copper dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Hardness	g/m3 as CaCO ₃	1	EDTA titration APHA 2340 C or calc if Ca and Mg determ APHA 5220B
Iron dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Iron total	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Lead dissolved	mg/m3	0.5	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Magnesium	g/m3	0.1	Flame AAS [APHA 3111 B]
Manganese dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Nickel dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Nitrate N	g/m3 as N	1	Automated Cadmium reduction spectrophotometry [APHA 4500-NO ₃ F]
Oxygen diss. field	mg/m3	0.1	Portable meter
pH field		0.1	Portable meter
pH lab		0.1	Glass electrode APHA 4500-H+
Phosphorus total	g/m3	0.005	Acid persulphate digestion; automated ascorbic acid reduction [APHA 4500-P B, F]
Potassium	g/m3	0.1	Flame AAS [APHA 3111 B]
Sodium	g/m3	0.1	Flame AAS [APHA 3111 B]
Sulphate	g/m3	0.5	Ion chromatography [APHA 4110 C]
Suspended solids	g/m3	3	Glass fibre filtration, dried at 103°C [APHA 2540 D]
Temperature field	°C	0.5	Portable meter
Turbidity field	NTU	0.1	Nephelometric meter
Turbidity lab	NTU	0.1	Nephelometry APHA 2130 B
Zinc dissolved	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Zinc total	mg/m3	1	Flame and graphite furnace AAS [APHA 3111 B, D, 3113 B]
Cation/Anion balance			Calculation
Oil & grease	g/m3	0.2	Partition-infrared method APHA 5520 C
Volatile Acids	g/m3	1	Ion chromatography [APHA 4110 C modified]
Phenols total	g/m3	0.001	Methylene chloride extraction; GC-MS [USEPA 625 modified]
Volatile organics	mg/m3	1	Purge and trap EPA 524.2
Semi-volatile organics	mg/m3	1	Base/neutral/acid extractable organics GC-MS USEPA 625 & 524.2
flow rate field	l/s	0.1	Weir, gauging and direct measurement
Metals digestion			Nitric acid. High pressure microwave. [USEPA method 3015]

Note 1: "Field" means measurement by TWM Redvale site staff either at the sample site or in the site laboratory.

Note 2: Dissolved = either field filtered by TWM Redvale site staff or filtered by the analytical lab if the sample is delivered in a short time.

* = Measurement required by consent conditions, from Landfill and Managed Fill

** = Analysis not required by consent conditions but required occasionally by TWM.

Figure 4.5.5.6

Appendix G Groundwater quality trigger levels

DRAFT

REDVALE LANDFILL

GROUND WATER QUALITY - TRIGGER LEVEL 1



Redvale Landfill, Landfill Access Road, Dairy Flat, RD4 Albany 0794. P O Box 228, Silverdale, Auckland 0944. Ph 09-427 0600.

PARAMETER	UNIT	TRIGGER LEVEL 1									
		TL1 is exceeded if any parameter exceeds the value below.									
	WELL>	M1	M2A	M7A	M8A	M9A	M10A	M11A	M12A	M13A	WM1A
Alkalinity	g/m3 as CaCO3	710	580(3)	506(3)	670(3)	540(3)	545(3)	419(3)	767(3)	Base	880(3)
Aluminium diss	mg/m3	**	**	**	**	**	**			line	**
Aluminium total	mg/m3									monit.	
Ammonia N	g/m3 as N	0.7	0.8(3)	0.19(3)	1.1(3)	0.5(3)	1.2(3)	0.78 (3)	20(3)		1.3(3)
Arsenic dissolved	mg/m3	tba	0.02(3)	0.05(1)	0.05(1)	0.05(1)	0.05(1)	0.005	0.005		0.05(1)
BOD5	g/m3										
Boron	mg/m3	3.5	0.40(3)	0.25(8)	6.9(3)	3.4(3)	3.4(3)	1.2 (3)	2.8(3)		6.0(3)
Cadmium diss	mg/m3										
Calcium	g/m3	75	130(3)	163(3)	100(3)	95(3)	115(3)	94(3)	89(3)		90(3)
Chloride	g/m3	73	30(3)	25(3)	380(3)	235(3)	330(3)	41(3)	115(3)		140(3)
Chromium diss	mg/m3	*	*	*	*	*	*	*	*		*
COD	g/m3	*	*	*	*	*	*	*	*		*
Conductivity field	mS/m	**	**	**	**	**	**	**	**		**
Conductivity lab	mS/m	163	100(3)	86(3)	180(3)	155(3)	170(3)	89(3)	145(3)		170(3)
Copper dissolved	mg/m3	*	*	*	*	*	*	*	*		*
Hardness	g/m3 as CaCO3	*	*	*	*	*	*	*	*		*
Iron dissolved	mg/m3	tba	1.5(3)	1.37(3)	0.3(3)	0.3(3)	0.3(3)	0.1	0.11(3)		0.3(1)
Iron total	mg/m3										
Lead dissolved	mg/m3	*	*	*	*	*	*	*	*		*
Magnesium	g/m3	23	15(3)	9(3)	33(3)	17(3)	8(3)	14.5(3)	13.8(3)		31(3)
Manganese diss	mg/m3	0.03	0.07(3)	0.5(2)	0.5(2)	0.5(2)	0.5(2)	0.8(3)	0.68(3)		0.5(2)
Nickel dissolved	mg/m3										
Nitrate	g/m3 as N	0.08	0.17(3)	10(1)	12(1)	20(1)	48(1)	0.32(3)	3.18(3)		10(1)
Oxygen diss	mg/m3										
pH upper		7.85	7.2(3)	8.5(1)	8.5(1)	8.5(1)	8.5(1)	7.5(3)	7.7(3)		8.5(1)
pH lower		6.93	6.5(3)	6.0(3)	6.5(3)	6.5(3)	6.5(3)	6.8(3)			6.8(3)
Phosphorus total	g/m3	**	**	**	**	**	**	**	**		**
Potassium	g/m3	9.7	11(3)	6.8(3)	12.5(3)	20.1(3)	17.8(3)	6.9(3)	11.7(3)		12(3)
Sodium	g/m3	264	107(3)	52(3)	310(3)	265(3)	285(3)	125(3)	255(3)		340(3)
Sulphate	g/m3	48	5(8)	38(3)	22(3)	57(3)	33(3)	89(3)	161(3)		55(3)
Suspended solids	g/m3										
Temperature field	°C	*	*	*	*	*	*	*	*		*
Turbidity field	NTU	**	**	**	**	**	**	**	**		**
Zinc dissolved	mg/m3	*	*	*	*	*	*	*	*		*
Zinc total	mg/m3										
Cation/Anion balance		*	*	*	*	*	*	*	*		*
Oil & grease	g/m3										
Volatile Acids	g/m3	*	*	*	*	*	*	*	*		*
Phenols total	g/m3	*	*	*	*	*	*	*	*		*
Volatile organics	mg/m3										
Semi-volatile organics	mg/m3										

* = monitored either quarterly or yearly, but no response limit applies.

** = analysis not required by consents but performed at discretion of site management.

(1) = ANZECC (1992), Australian water quality guidelines for fresh and marine waters, stds for aquatic ecosystems and raw water for drinking water supply.

(2) = NZDWS (1995), National drinking water standards for New Zealand, Ministry of Health, Wellington.

(3) = Mean plus three standard deviations from background data.

(4) = Mean plus four standard deviations from background data.

(5) = Netherlands (1983), Dutch A Groundwater contamination criteria, VROM soil protection guideline 1983/1990 Staatsutguvereij. The Hague.

(6) = USEPA (1990), Drinking water regulations and health advisories.

(7) = USEPA (1994), Water quality standards regulations (40CFR 131). Washington D.C.

(8) = Practical Quantitation Limit (PQL) x 1

(9) = Practical Quantitation Limit (PQL) x 2

(10) = USEPA (1999), National recommended water quality criteria - correction.

Figure 4.5.5.7

REDVALE LANDFILL

GROUND WATER QUALITY - TRIGGER LEVEL 2



Redvale Landfill, Landfill Access Road, Dairy Flat, RD4 Albany 0794. P O Box 228, Silverdale, Auckland 0944. Ph 09-427 0600.

PARAMETER	UNIT	TRIGGER LEVEL 2									
		TL2 is exceeded if any parameter exceeds the value below.									
	WELL>	M1	M2A	M7A	M8A	M9A	M10A	M11A	M12A	M13A	WM1A
Alkalinity	g/m3 as CaCO3	734	600(4)	610(4)	715(4)	580(4)	605(4)	435 (4)	884(4)	Base	910(4)
Aluminium diss	mg/m3	**	**	**	**	**	**	**	**	Line	**
Aluminium total	mg/m3									monit.	
Ammonia N	g/m3 as N	0.9	3.0(10)	0.22(4)	1.3(4)	0.6(4)	1.4(4)	0.87(4)	25(4)		1.6(4)
Arsenic dissolved	mg/m3	tba	0.15(10)	0.05(1)	0.05(1)	0.05(1)	0.05(1)	0.01(2)	0.01(2)		0.05(1)
BOD5	g/m3										
Boron	mg/m3	3.9	0.5(9)	0.5(9)	7.5(4)	3.6(4)	3.7(4)	1.3(4)	3.2(4)		6.6(4)
Cadmium diss	mg/m3										
Calcium	g/m3	78	140(4)	197(4)	105(4)	105(4)	130(4)	99(4)	96(4)		100(4)
Chloride	g/m3	250	125(2)	400(1)	430(4)	255(4)	365(4)	250(2)	250(4)		400(1)
Chromium diss	mg/m3	*	*	*	*	*	*	*	*		*
COD	g/m3	*	*	*	*	*	*	*	*		*
Conductivity field	mS/m	**	**	**	**	**	**	**	**		**
Conductivity lab	mS/m	174	150(1)	101(4)	190(4)	160(4)	180(4)	90(4)	159(4)		180(4)
Copper dissolved	mg/m3	*	*	*	*	*	*	*	*		*
Hardness	g/m3 as CaCO3	*	*	*	*	*	*	*	*		*
Iron dissolved	mg/m3	tba	1.9(4)	1.64(4)	0.3(1)	0.3(1)	0.3(1)	0.2(2)	0.2(2)		0.3(1)
Iron total	mg/m3										
Lead dissolved	mg/m3	*	*	*	*	*	*	*	*		*
Magnesium	g/m3	24	125(2)	11(4)	36(4)	20(4)	9(4)	15.6(4)	15.6(4)		33(4)
Manganese diss	mg/m3	1.9	0.50(2)	0.5(2)	0.5(2)	0.5(2)	0.5(2)	1.9(4)	1.9(4)		0.5(2)
Nickel dissolved	mg/m3										
Nitrate	g/m3 as N	11	11(2)	10(1)	15(1)	23(1)	57(1)	11.3(2)	11.3(2)		10(1)
Oxygen diss	mg/m3										
pH upper		8.0	9.0(1)	8.5(1)	8.5(1)	8.5(1)	8.5(1)	8.5(2)	7.8(4)		8.5(1)
pH lower		6.78	6.4(4)	5.7(4)	6.5(1)	6.5(1)	6.5(1)	6.9(2)	6.8(4)		6.5(1)
Phosphorus total	g/m3	**	**	**	**	**	**	**	**		**
Potassium	g/m3	10.1	13(4)	8.3(4)	13(4)	22.6(4)	19(4)	7.2(4)	13.1(4)		12.4(4)
Sodium	g/m3	270	200(2)	300(1)	320(4)	280(4)	295(4)	200(2)	293(4)		345(4)
Sulphate	g/m3	54	10(9)	43(4)	26(4)	65(4)	39(4)	250(2)	250(2)		60(4)
Suspended solids	g/m3										
Temperature field	°C	*	*	*	*	*	*	*	*		*
Turbidity field	NTU	**	**	**	**	**	**	**	**		**
Zinc dissolved	mg/m3	*	*	*	*	*	*	*	*		*
Zinc total	mg/m3										
Cation/Anion balance		*	*	*	*	*	*	*	*		*
Oil & grease	g/m3										
Volatile Acids	g/m3	*	*	*	*	*	*	*	*		*
Phenols total	g/m3	*	*	*	*	*	*	*	*		*
Volatile organics	mg/m3										
Semi-volatile organics	mg/m3										

* = monitored either quarterly or yearly, but no response limit applies.

** = analysis not required by consents but performed at discretion of site management.

(1) = ANZECC (1992), Australian water quality guidelines for fresh and marine waters, stds for aquatic ecosystems and raw water for drinking water supply.

(2) = NZDWS (1995), National drinking water standards for New Zealand, Ministry of Health, Wellington.

(3) = Mean plus three standard deviations from background data.

(4) = Mean plus four standard deviations from background data.

(5) = Netherlands (1983), Dutch A Groundwater contamination criteria, VROM soil protection guideline 1983/1990 Staatsutgvereij. The Hague.

(6) = USEPA (1990), Drinking water regulations and health advisories.

(7) = USEPA (1994), Water quality standards regulations (40CFR 131). Washington D.C.

(8) = Practical Quantitation Limit (PQL) x 1

(9) = Practical Quantitation Limit (PQL) x 2

(10) = USEPA (1999), National recommended water quality criteria - correction.

Figure 4.5.5.8

REDVALE LANDFILL MANAGEMENT PLAN

Contingency Plan Flowchart

Surface Water and Ground Water

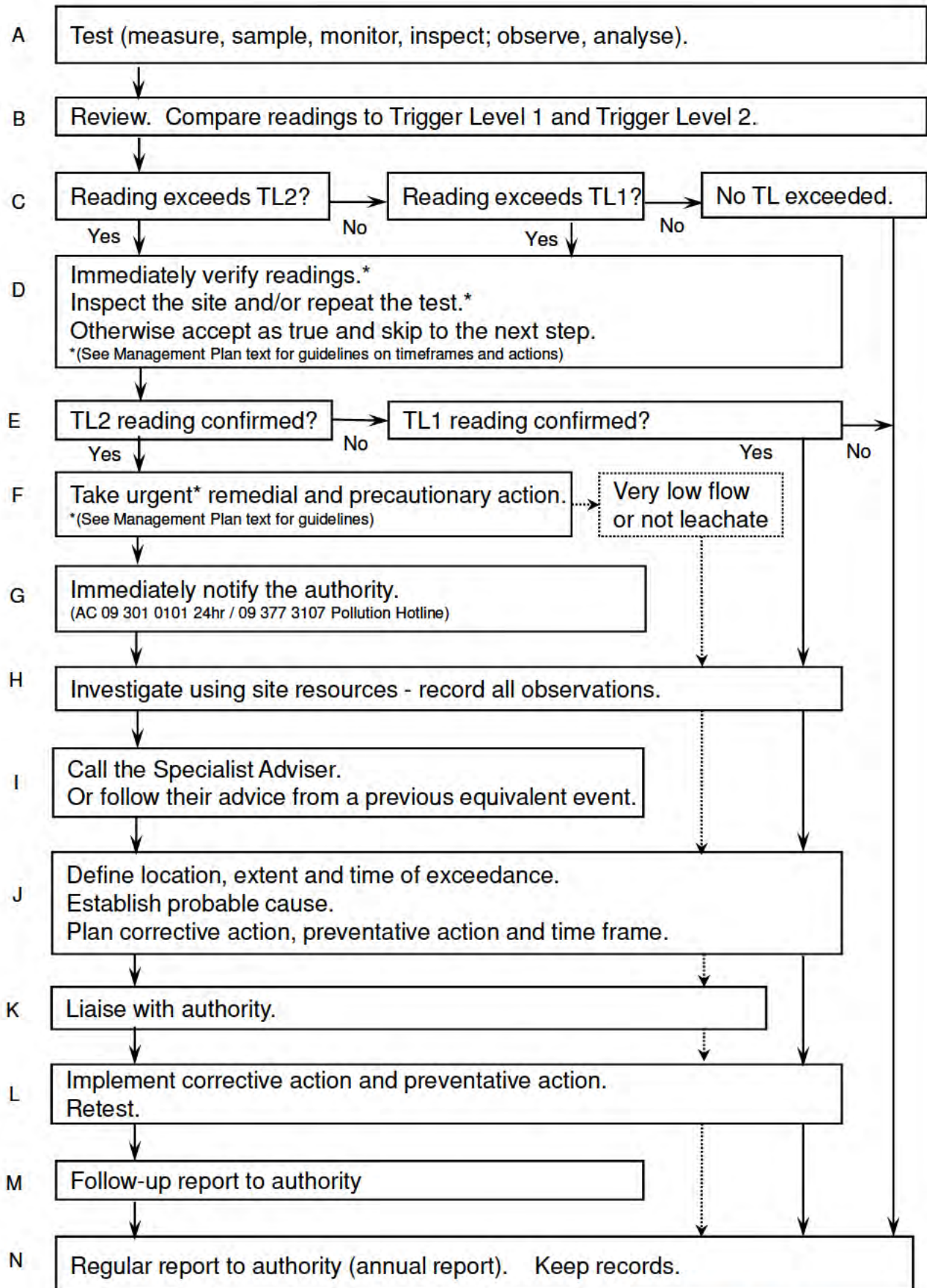


Figure 4.5.5.9

Contingency Plan Flow Chart Explanation

Line	Action
A	Take surface water or groundwater samples. In case of groundwater, take groundwater level too. The monitoring event may also be making observations that are relevant to water quality but do not necessarily require a test result.
B	Review results. Compare results to trigger levels in this Landfill Management Plan. It is the responsibility of the Landfill Engineer to do this and instigate any actions required by the contingency plan.
C	Determine whether any result is a TL1 or TL2 exceedance.
D	If any TL is exceeded, immediately verify the reading. Either (a) Accept on the spot that the reading is correct i.e. confirmed and proceed to the next step, or (b) Check that the reading is correct by methods such as inspection and retesting provided that this can be done immediately. As a guide, “immediately” means (for surface water): As soon as practical taking into account factors such as safety, daylight, weather intensity, the time it reasonably takes to close a valve, the time it reasonably takes to quickly deploy equipment or machinery to the relevant part of the site, etc. In most cases this would be within ½ hour to ½ day. For ground water: Without undue delay. In most cases this would be within 1 month.
E	Confirm whether the TL reading is correct.
F	If TL2 is exceeded, take urgent remedial and precautionary action, and proceed immediately to the next step. . It is noted that in the case of slow-moving ground water, the scope of urgent action may be small, but still proceed immediately to the next step. As a guide, possible actions are included in the next section.
G	If TL2 is exceeded, notify the authority (Auckland Council-Env), immediately. Ph (09) 301 0101 24hr or (09) 3773107 Pollution Hotline.
H	If TL1 or TL2 is exceeded, investigate using site resources. As a guide, possible actions include (if not already done at Step D): • Check the status of test devices e.g. equipment calibration, equipment state of maintenance, and field or laboratory methods; • Repeat the test; • Inspect the site to confirm other factors such as flow rate, contaminant sources, extent of contamination; • Inspect downstream ground surface and surface water for ill-effects.
I	Call the Specialist Advisor. Alternatively, take the action recommended by the Specialist Adviser on a previous occasion in which the same exceedance occurred and written advice was obtained.
J	If TL1 or TL2 is exceeded, complete investigations to adequately proceed with the following steps: • define the location, extent, severity, time and growth rate of exceedance and of any contamination; • establish the probable cause; • plan corrective action, preventative action, and time frame, in liaison with AC. As a guide, possible actions are included in the next section.
K	If TL2 is exceeded, liaise with AC in regard to an acceptable action plan.
L	If TL1 or TL2 is exceeded, implement both corrective actions and preventative actions. Then retest any parameter that had a TL2 exceedance.
M	If TL2 is exceeded, and contamination confirmed by the Specialist Adviser, prepare a written report to the AC explaining: • the nature of the contaminant; • the cause of contamination; • remedial actions taken; • preventative actions taken.
N	Report all test results to the AC on an annual basis. Record response actions taken. Keep records on the site for the duration of the landfill operation.

Figure 4.5.5.9

Appendix H Groundwater level – trigger levels

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REDVALE LANDFILL

GROUND WATER QUALITY - TRIGGER LEVEL 1



Redvale Landfill, Landfill Access Road, Dairy Flat, RD4 Albany 0794. P O Box 228, Silverdale, Auckland 0944. Ph 09-427 0600.

PARAMETER	UNIT	TRIGGER LEVEL 1									
		TL1 is exceeded if any parameter exceeds the value below.									
	WELL>	M1	M2A	M7A	M8A	M9A	M10A	M11A	M12A	M13A	WM1A
Alkalinity	g/m3 as CaCO3	710	580(3)	506(3)	670(3)	540(3)	545(3)	419(3)	767(3)	Base	880(3)
Aluminium diss	mg/m3	**	**	**	**	**	**	**	**	line	**
Aluminium total	mg/m3									monit.	
Ammonia N	g/m3 as N	0.7	0.8(3)	0.19(3)	1.1(3)	0.5(3)	1.2(3)	0.78 (3)	20(3)		1.3(3)
Arsenic dissolved	mg/m3	tba	0.02(3)	0.05(1)	0.05(1)	0.05(1)	0.05(1)	0.005	0.005		0.05(1)
BOD5	g/m3										
Boron	mg/m3	3.5	0.40(3)	0.25(8)	6.9(3)	3.4(3)	3.4(3)	1.2 (3)	2.8(3)		6.0(3)
Cadmium diss	mg/m3										
Calcium	g/m3	75	130(3)	163(3)	100(3)	95(3)	115(3)	94(3)	89(3)		90(3)
Chloride	g/m3	73	30(3)	25(3)	380(3)	235(3)	330(3)	41(3)	115(3)		140(3)
Chromium diss	mg/m3	*	*	*	*	*	*	*	*		*
COD	g/m3	*	*	*	*	*	*	*	*		*
Conductivity field	mS/m	**	**	**	**	**	**	**	**		**
Conductivity lab	mS/m	163	100(3)	86(3)	180(3)	155(3)	170(3)	89(3)	145(3)		170(3)
Copper dissolved	mg/m3	*	*	*	*	*	*	*	*		*
Hardness	g/m3 as CaCO3	*	*	*	*	*	*	*	*		*
Iron dissolved	mg/m3	tba	1.5(3)	1.37(3)	0.3(3)	0.3(3)	0.3(3)	0.1	0.11(3)		0.3(1)
Iron total	mg/m3										
Lead dissolved	mg/m3	*	*	*	*	*	*	*	*		*
Magnesium	g/m3	23	15(3)	9(3)	33(3)	17(3)	8(3)	14.5(3)	13.8(3)		31(3)
Manganese diss	mg/m3	0.03	0.07(3)	0.5(2)	0.5(2)	0.5(2)	0.5(2)	0.8(3)	0.68(3)		0.5(2)
Nickel dissolved	mg/m3										
Nitrate	g/m3 as N	0.08	0.17(3)	10(1)	12(1)	20(1)	48(1)	0.32(3)	3.18(3)		10(1)
Oxygen diss	mg/m3										
pH upper		7.85	7.2(3)	8.5(1)	8.5(1)	8.5(1)	8.5(1)	7.5(3)	7.7(3)		8.5(1)
pH lower		6.93	6.5(3)	6.0(3)	6.5(3)	6.5(3)	6.5(3)	6.8(3)			6.8(3)
Phosphorus total	g/m3	**	**	**	**	**	**	**	**		**
Potassium	g/m3	9.7	11(3)	6.8(3)	12.5(3)	20.1(3)	17.8(3)	6.9(3)	11.7(3)		12(3)
Sodium	g/m3	264	107(3)	52(3)	310(3)	265(3)	285(3)	125(3)	255(3)		340(3)
Sulphate	g/m3	48	5(8)	38(3)	22(3)	57(3)	33(3)	89(3)	161(3)		55(3)
Suspended solids	g/m3										
Temperature field	°C	*	*	*	*	*	*	*	*		*
Turbidity field	NTU	**	**	**	**	**	**	**	**		**
Zinc dissolved	mg/m3	*	*	*	*	*	*	*	*		*
Zinc total	mg/m3										
Cation/Anion balance		*	*	*	*	*	*	*	*		*
Oil & grease	g/m3										
Volatile Acids	g/m3	*	*	*	*	*	*	*	*		*
Phenols total	g/m3	*	*	*	*	*	*	*	*		*
Volatile organics	mg/m3										
Semi-volatile organics	mg/m3										

* = monitored either quarterly or yearly, but no response limit applies.

** = analysis not required by consents but performed at discretion of site management.

(1) = ANZECC (1992), Australian water quality guidelines for fresh and marine waters, stds for aquatic ecosystems and raw water for drinking water supply.

(2) = NZDWS (1995), National drinking water standards for New Zealand, Ministry of Health, Wellington.

(3) = Mean plus three standard deviations from background data.

(4) = Mean plus four standard deviations from background data.

(5) = Netherlands (1983), Dutch A Groundwater contamination criteria, VROM soil protection guideline 1983/1990 Staatsutgvereij. The Hague.

(6) = USEPA (1990), Drinking water regulations and health advisories.

(7) = USEPA (1994), Water quality standards regulations (40CFR 131). Washington D.C.

(8) = Practical Quantitation Limit (PQL) x 1

(9) = Practical Quantitation Limit (PQL) x 2

(10) = USEPA (1999), National recommended water quality criteria - correction.

Figure 4.5.5.7

REDVALE LANDFILL

GROUND WATER QUALITY - TRIGGER LEVEL 2



Redvale Landfill, Landfill Access Road, Dairy Flat, RD4 Albany 0794. P O Box 228, Silverdale, Auckland 0944. Ph 09-427 0600.

PARAMETER	UNIT	TRIGGER LEVEL 2									
		TL2 is exceeded if any parameter exceeds the value below.									
	WELL>	M1	M2A	M7A	M8A	M9A	M10A	M11A	M12A	M13A	WM1A
Alkalinity	g/m3 as CaCO3	734	600(4)	610(4)	715(4)	580(4)	605(4)	435 (4)	884(4)	Base	910(4)
Aluminium diss	mg/m3	**	**	**	**	**	**	**	**	Line	**
Aluminium total	mg/m3									monit.	
Ammonia N	g/m3 as N	0.9	3.0(10)	0.22(4)	1.3(4)	0.6(4)	1.4(4)	0.87(4)	25(4)		1.6(4)
Arsenic dissolved	mg/m3	tba	0.15(10)	0.05(1)	0.05(1)	0.05(1)	0.05(1)	0.01(2)	0.01(2)		0.05(1)
BOD5	g/m3										
Boron	mg/m3	3.9	0.5(9)	0.5(9)	7.5(4)	3.6(4)	3.7(4)	1.3(4)	3.2(4)		6.6(4)
Cadmium diss	mg/m3										
Calcium	g/m3	78	140(4)	197(4)	105(4)	105(4)	130(4)	99(4)	96(4)		100(4)
Chloride	g/m3	250	125(2)	400(1)	430(4)	255(4)	365(4)	250(2)	250(4)		400(1)
Chromium diss	mg/m3	*	*	*	*	*	*	*	*		*
COD	g/m3	*	*	*	*	*	*	*	*		*
Conductivity field	mS/m	**	**	**	**	**	**	**	**		**
Conductivity lab	mS/m	174	150(1)	101(4)	190(4)	160(4)	180(4)	90(4)	159(4)		180(4)
Copper dissolved	mg/m3	*	*	*	*	*	*	*	*		*
Hardness	g/m3 as CaCO3	*	*	*	*	*	*	*	*		*
Iron dissolved	mg/m3	tba	1.9(4)	1.64(4)	0.3(1)	0.3(1)	0.3(1)	0.2(2)	0.2(2)		0.3(1)
Iron total	mg/m3										
Lead dissolved	mg/m3	*	*	*	*	*	*	*	*		*
Magnesium	g/m3	24	125(2)	11(4)	36(4)	20(4)	9(4)	15.6(4)	15.6(4)		33(4)
Manganese diss	mg/m3	1.9	0.50(2)	0.5(2)	0.5(2)	0.5(2)	0.5(2)	1.9(4)	1.9(4)		0.5(2)
Nickel dissolved	mg/m3										
Nitrate	g/m3 as N	11	11(2)	10(1)	15(1)	23(1)	57(1)	11.3(2)	11.3(2)		10(1)
Oxygen diss	mg/m3										
pH upper		8.0	9.0(1)	8.5(1)	8.5(1)	8.5(1)	8.5(1)	8.5(2)	7.8(4)		8.5(1)
pH lower		6.78	6.4(4)	5.7(4)	6.5(1)	6.5(1)	6.5(1)	6.9(2)	6.8(4)		6.5(1)
Phosphorus total	g/m3	**	**	**	**	**	**	**	**		**
Potassium	g/m3	10.1	13(4)	8.3(4)	13(4)	22.6(4)	19(4)	7.2(4)	13.1(4)		12.4(4)
Sodium	g/m3	270	200(2)	300(1)	320(4)	280(4)	295(4)	200(2)	293(4)		345(4)
Sulphate	g/m3	54	10(9)	43(4)	26(4)	65(4)	39(4)	250(2)	250(2)		60(4)
Suspended solids	g/m3										
Temperature field	°C	*	*	*	*	*	*	*	*		*
Turbidity field	NTU	**	**	**	**	**	**	**	**		**
Zinc dissolved	mg/m3	*	*	*	*	*	*	*	*		*
Zinc total	mg/m3										
Cation/Anion balance		*	*	*	*	*	*	*	*		*
Oil & grease	g/m3										
Volatile Acids	g/m3	*	*	*	*	*	*	*	*		*
Phenols total	g/m3	*	*	*	*	*	*	*	*		*
Volatile organics	mg/m3										
Semi-volatile organics	mg/m3										

* = monitored either quarterly or yearly, but no response limit applies.

** = analysis not required by consents but performed at discretion of site management.

(1) = ANZECC (1992), Australian water quality guidelines for fresh and marine waters, stds for aquatic ecosystems and raw water for drinking water supply.

(2) = NZDWS (1995), National drinking water standards for New Zealand, Ministry of Health, Wellington.

(3) = Mean plus three standard deviations from background data.

(4) = Mean plus four standard deviations from background data.

(5) = Netherlands (1983), Dutch A Groundwater contamination criteria, VROM soil protection guideline 1983/1990 Staatsutgvereij. The Hague.

(6) = USEPA (1990), Drinking water regulations and health advisories.

(7) = USEPA (1994), Water quality standards regulations (40CFR 131). Washington D.C.

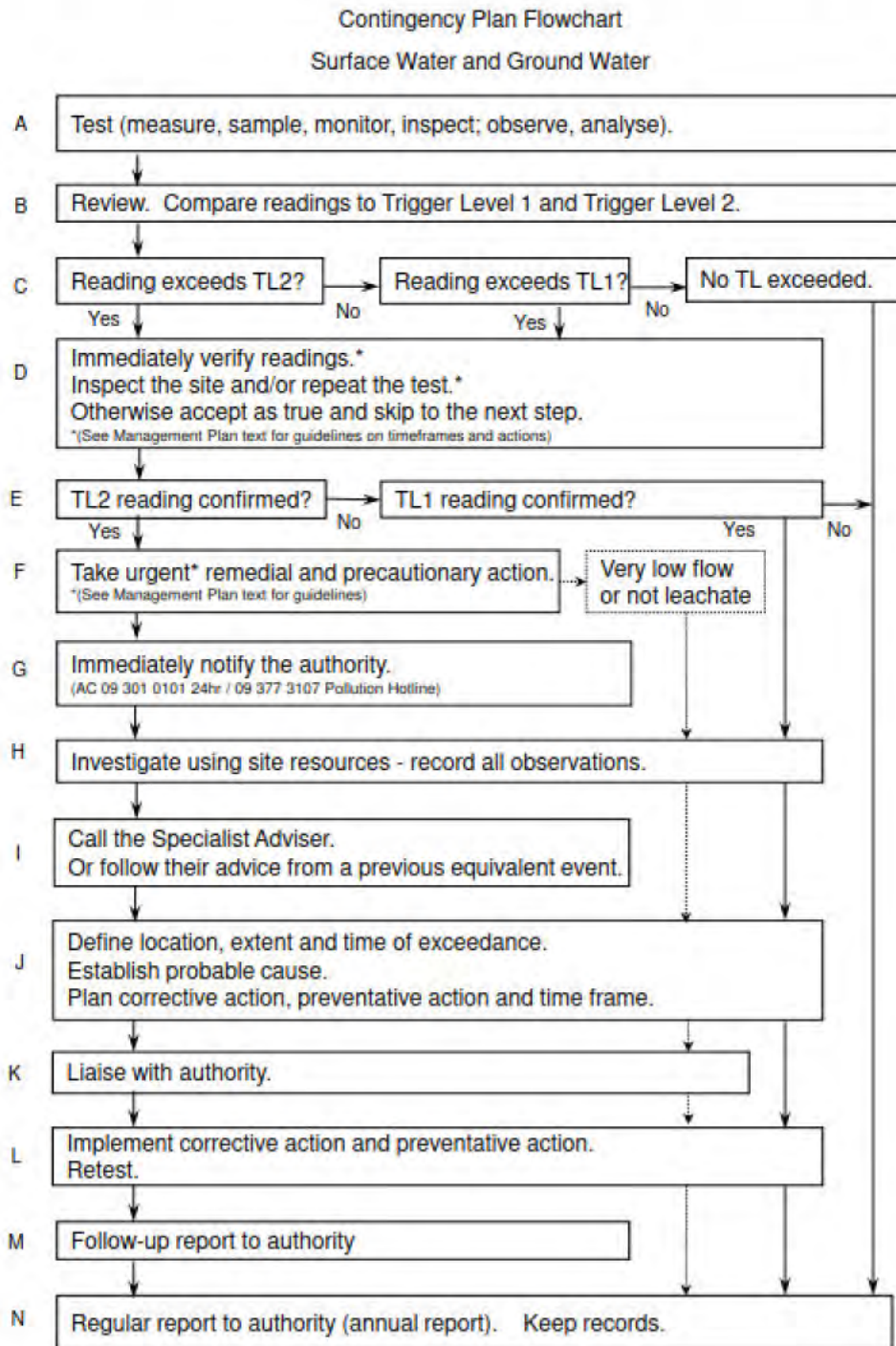
(8) = Practical Quantitation Limit (PQL) x 1

(9) = Practical Quantitation Limit (PQL) x 2

(10) = USEPA (1999), National recommended water quality criteria - correction.

Figure 4.5.5.8

Appendix I Contingency plan flow chart



3.21 Leachate Monitoring and Contingency Plan

3.21.1 Leachate containment

3.21.1.1 Lining system

A liner of re-compacted low permeability material, such as mudstone, clay or similar which within the existing landfill footprint has a hydraulic conductivity of not greater than 1×10^{-9} m/s and with a minimum thickness of 0.9m will be constructed at all locations.

The lining system in the proposed Class 2 footprint extension (which will only be filled with non-putrescible construction and demolition waste i.e. waste meeting the Class 2 waste acceptance criteria [WAC]) will be a continuous “low permeability” liner layer of 0.9m minimum thickness of compacted earth fill whose permeability is less than 1×10^{-8} m/s.

The liner quality assurance report prepared by the Independent Liner Review Team is required to be approved by Peer Review Panel and Auckland Council before the refuse placement in the area.

3.21.1.2 Leachate Minimisation

The landfill will adopt practices which reduce the amount of leachate to a practical minimum. Methods will include:

- restricting the amount of open (rain-catching) new lining system which connects to leachate drains
- restricting the time that completed new lining system areas are open by promptly completing and sealing the first lift of refuse
- restricting the timing of moving to a new cell; which requires placing a fluff layer of waste, to periods dry weather to minimise stormwater collection
- construction of drains along the long-run liner slopes
- controlling perimeter surface water drainage
- lining of stormwater channels
- placing intermediate cover promptly
- forming intermediate cover at grades which encourage run-off (without erosion)
- placing final cover as soon as practical after completion of the refuse pile to final height
- maintenance and repair of topsoil and grass on the final cover
- repair of final cover if it becomes distressed due to drying, erosion, settlement or gas
- rejecting excessive amounts of liquid wastes and discouraging wet wastes
- constructing a low permeability liner to restrict groundwater inflow if any
- Regular inspection of the site to ensure there are adequate drains to divert the stormwater from the active tipping area
- Establishing the stormwater control measures for minimising the leachate to the satisfaction of the landfill engineer, especially when joining a new cell with existing cells.

3.21.2 Leachate collection

3.21.2.1 Leachate Collection Overview

The sides and floor of the lined landfill excavation will have minimum grades to ensure that leachate will flow towards one of four sumps. The flattest grades on the floor will be 2% and the flattest grades in the leachate collection pipes will be 1%. No drainage blanket will be installed within the current landfill footprint. The first lift of refuse on the floor will not be compacted, in order for this layer to remain relatively permeable ('fluff layer').

Site development plans in Section 1.6 show that leachate collection drains within the current landfill footprint are installed at the foot of the side wall and at 120 m intervals across the floor (Site development plans in Section 1.6). The floor base grade has at least 2% fall towards these leachate drains. The leachate drains are accessible for flushing if necessary at clean-out riser ports. All leachate drains lead to one of four sumps. The leachate must flow out of the holes in the collection pipes, through gravel occupying the sumps, and into the larger diameter collection risers containing dedicated submersible pumps. The pumps deliver the leachate through the collection risers to ports along the perimeter road, and then through delivery pipes to the treatment plant.

The proposed Class 2 footprint extension comprises the following:

- Basegrade is generally bowl-shaped with a flat floor and steep side slopes.
- The floor forms a vee-shaped valley grading in a south-easterly direction toward a low point of approximately RL 65 m near the existing Pond 6 dam.
- The floor is graded at 3% towards the central valley, with the centreline of the valley itself having a minimum grade of 2%.
- The side walls are graded at 1V:3H, with height varying from 30 m (NW side) to 2 m (SE corner).
- Lateral leachate cut-off pipes will be located at nominal 70 m intervals across the floor.
- Leachate collection pipes will be installed at the toe of the side walls.
- A leachate header pipe will be installed along the central valley of the floor.
- A leachate collection sump will be constructed at the low point to allow leachate to be extracted via pumping through a non-perforated HDPE pipe installed down the side wall (similar to those already in use within the existing landfill footprint).
- Non-perforated leachate cleanout risers will be provided on the side walls to allow flushing of the leachate header pipes.
- A leachate drainage blanket is proposed above the lining system to allow leachate to flow towards the leachate pipes, comprising either 300 mm of drainage aggregate, tyre derived aggregate or a suitable geosynthetic drainage layer.

The submersible pumps are powered by mains electric power with emergency back-up provided by either a trailer-mounted or fixed diesel-electric generator. Pumping will be performed by pumping for continuous periods of between several hours and several days at a time, depending on operational requirements, to the leachate holding tank at the BeneVap or directly into road tankers. The frequency may change depending on circumstances such as lack of leachate or excessive accumulation of leachate e.g. when there is a need to allow for the connection of new leachate collection drains.

To aid leachate flow through the waste pile without causing leachate breakouts, appropriate practices will be adopted:

- removal of daily cover at least in part (creating "windows" to avoid perched leachate) sloping of daily cover, roads and other potentially buried low-permeability surfaces away from the edge of the landfill

3.21.2.2 Leachate collection drains

The general design of the leachate collection system has been included in site development figures (Section 1.6, Appendix A).

Supplementary collections drains will be installed as considered necessary, for example to help maintain low leachate levels where the adjacent regional groundwater level is low, and for example to optimise drainage behind temporary bunds at the edge of completed sections of the lining system.

3.21.2.3 Temporary sumps

Temporary leachate pumping chambers will be installed wherever the direction of progress from phase to phase is down-slope.

The planning phasing for the Class 2 extension area does not include any down-slope development.

3.21.3 Leachate disposal

Currently, approximately 80% of the leachate is carted off site for disposal at the Watercare Trade Waste facility in Selwood Road, Henderson or the Waste Management Technical Services plant at Neales Road. The remainder of the leachate is evaporated onsite in the Leachate Evaporator Unit (BeneVap 300).

3.21.3.1 Leachate evaporator

The site is currently running a BeneVap 300 unit for the treatment of leachate. The unit internal vessel combustion runs on a temperature between 85-90°C. The exhaust from the unit is discharged to the atmosphere and is required to meet the discharge criteria as per the conditions of the consent. More details regarding the BeneVap operation can be found in the BeneVap Management Plan, Section 3.9 of this LMP.

The residual sludge (concentrated leachate) which is a by-product of the process will be returned to the landfill.

3.21.3.2 Leachate Tankering off site

Approximately 80% of the leachate from the landfill is transported off site for treatment/disposal. Leachate is pumped directly out of sump (LCS1). The tank driver has to park the vehicle in the filling bay adjacent to the finger ponds and connect the hoses to the tanker to fill point. It is to ensure that all the connections are secure before starting the filling process. Any spills are cleaned up immediately to ensure that ponds are not contaminated. In case of large spills staff from Energy Park can be notified on 24hr callout # 02743161655 or on standby number 021318526. All the leachate pump into the tanks is recorded and transported safely for disposal/treatment.

The BeneVap will be removed and decommissioned when filling proceeds within this area of the landfill for the Class 1 expansion. Once the BeneVap is decommissioned, 100% of the leachate from the landfill will be transported off site for treatment/disposal.

3.21.4 Other liquids

The disposal of site-generated wastes is described in Section 3.2 of this LMP titled "Disposal". Two of these site-generated wastes in particular are liquids which are akin to leachate, i.e. truck wash pit sludge and truck wash effluent grease trap trappings. They will be dealt with in a similar manner i.e. by disposal into the waste either by direct tipping at the tip face or by delivery into injection ports.

3.21.5 Leachate monitoring

3.21.5.1 Leachate head on liner

WMNZ has installed systems to measure the leachate head on the liner. The measurement is undertaken by use of a bubbler technology in which the pressure created by the leachate in the landfill is measured and converted into meter head of the leachate. In accordance with Conditions 94 and 95, the leachate level in well LM1 must not exceed RL 51.0 m and must be maintained at all times at least 0.5 m below the groundwater level in adjacent bore WL3S (or an agreed replacement bore),

Redvale Landfill Management Plan

measured at least monthly and reported to Auckland Council quarterly. The leachate collection system for the Class 2 extension is designed to maintain a leachate head of less than 300 mm on the liner (other than within the sump).

In addition, WMNZ will be trialling the use of additional monitoring points and dataloggers at the leachate collection sumps.

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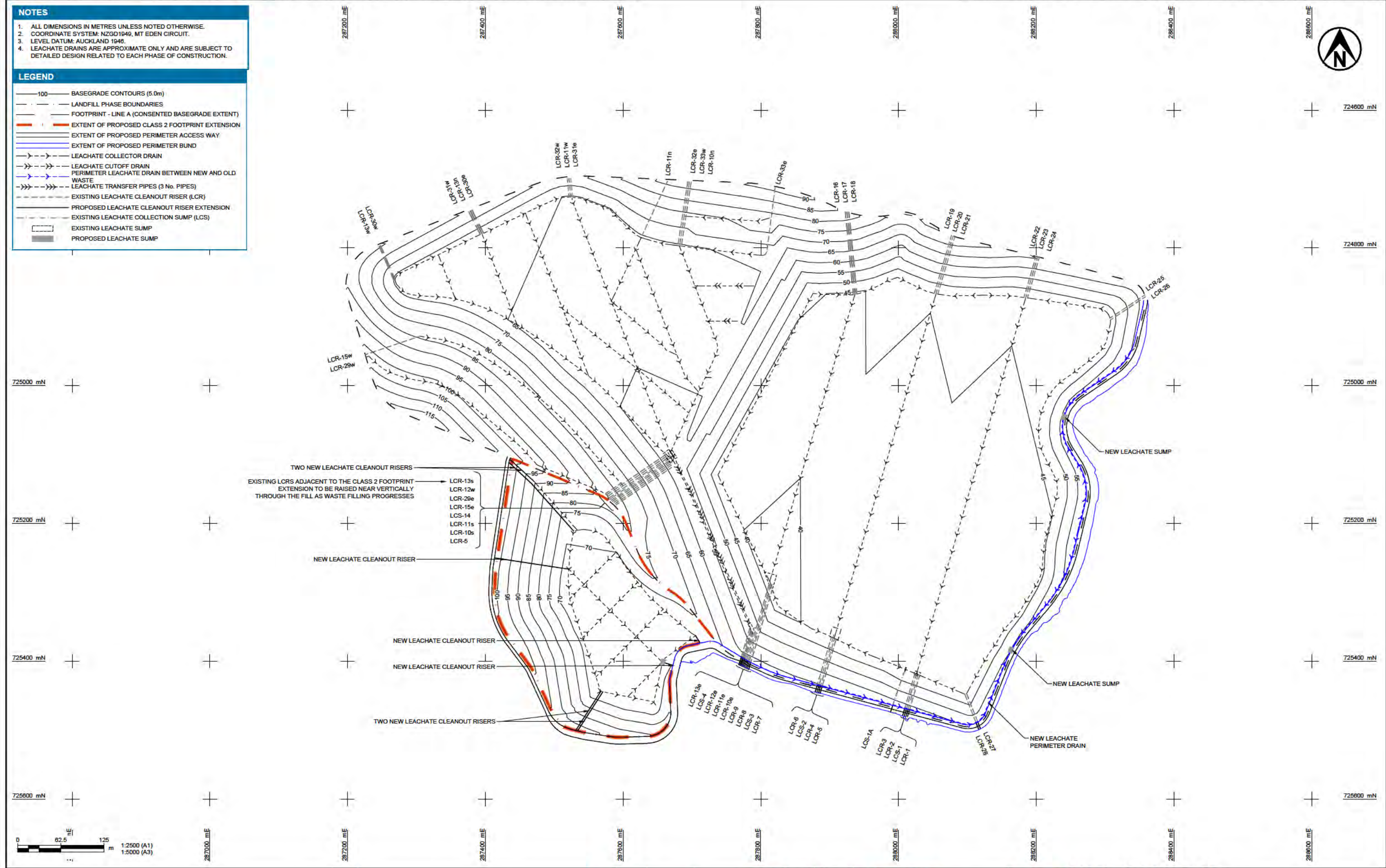
Appendix A Leachate Collection Plan

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1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATE SYSTEM: NZGD1949, MT EDEN CIRCUIT.
3. LEVEL DATUM: AUCKLAND 1946.
4. LEACHATE DRAINS ARE APPROXIMATE ONLY AND ARE SUBJECT TO DETAILED DESIGN RELATED TO EACH PHASE OF CONSTRUCTION.

Legend:

- 100 — BASEGRADE CONTOURS (5.0m)
- LANDFILL PHASE BOUNDARIES
- FOOTPRINT - LINE A (CONSENTED BASEGRADE EXTENT)
- EXTENT OF PROPOSED CLASS 2 FOOTPRINT EXTENSION
- EXTENT OF PROPOSED PERIMETER ACCESS WAY
- EXTENT OF PROPOSED PERIMETER BUND
- - - - - LEACHATE COLLECTOR DRAIN
- - - - - LEACHATE CUTOFF DRAIN
- - - - - PERIMETER LEACHATE DRAIN BETWEEN NEW AND OLD WASTE
- - - - - LEACHATE TRANSFER PIPES (3 No. PIPES)
- - - - - EXISTING LEACHATE CLEANOUT RISER (LCR)
- - - - - PROPOSED LEACHATE CLEANOUT RISER EXTENSION
- - - - - EXISTING LEACHATE COLLECTION SUMP (LCS)
- - - - - EXISTING LEACHATE SUMP
- - - - - PROPOSED LEACHATE SUMP



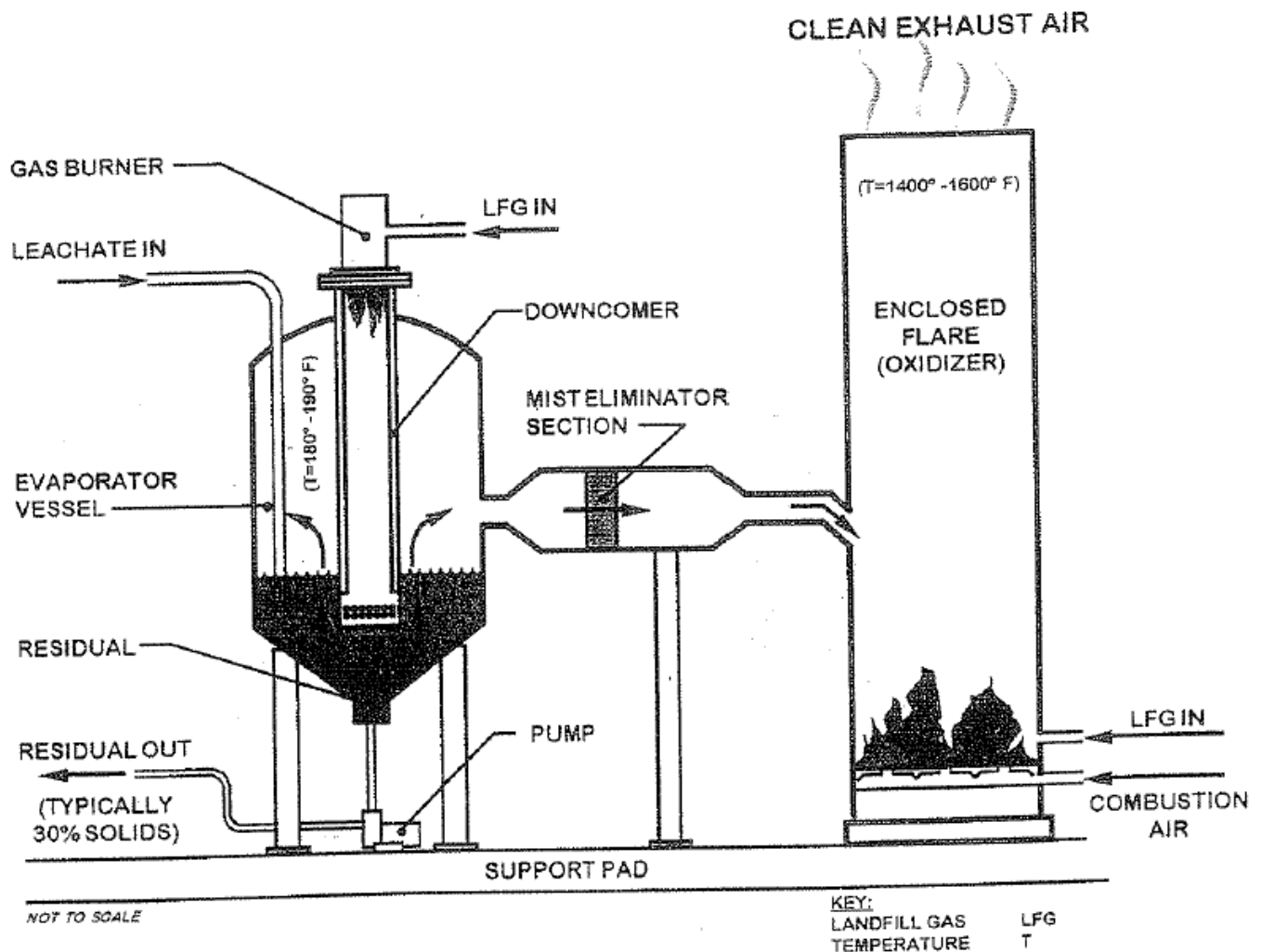
www.tonkintaylor.co.nz

					DESIGNED DRAWN DESIGN CHECKED DRAWING CHECKED	KJUN KATU	Mar.25 Mar.25	DRAWING STATUS CLIENT REVIEW PROJECT PHASE CONCEPT DESIGN	CLIENT PROJECT TITLE	WM NEW ZEALAND REDDALE LANDFILL EXPANSION LEACHATE COLLECTION LAYOUT	DRAFT			
2	CLIENT REVIEW COMMENTS	MELP	KJUN	19.12.25	NOT FOR CONSTRUCTION THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED									
1	CLIENT REVIEW ISSUE	KATU	KJUN	15.07.25										
REV	DESCRIPTION	CAD	CHK	DATE	APPROVED	DATE			SCALE (A1)	1:2500	DWG No.	1092369.3000-C12	REV	2

Appendix B Schematic of the leachate evaporator system (LEU)

DRAFT

SCHEMATIC OF THE LEACHATE EVAPORATOR SYSTEM



OMNI-GEN TECHNOLOGIES

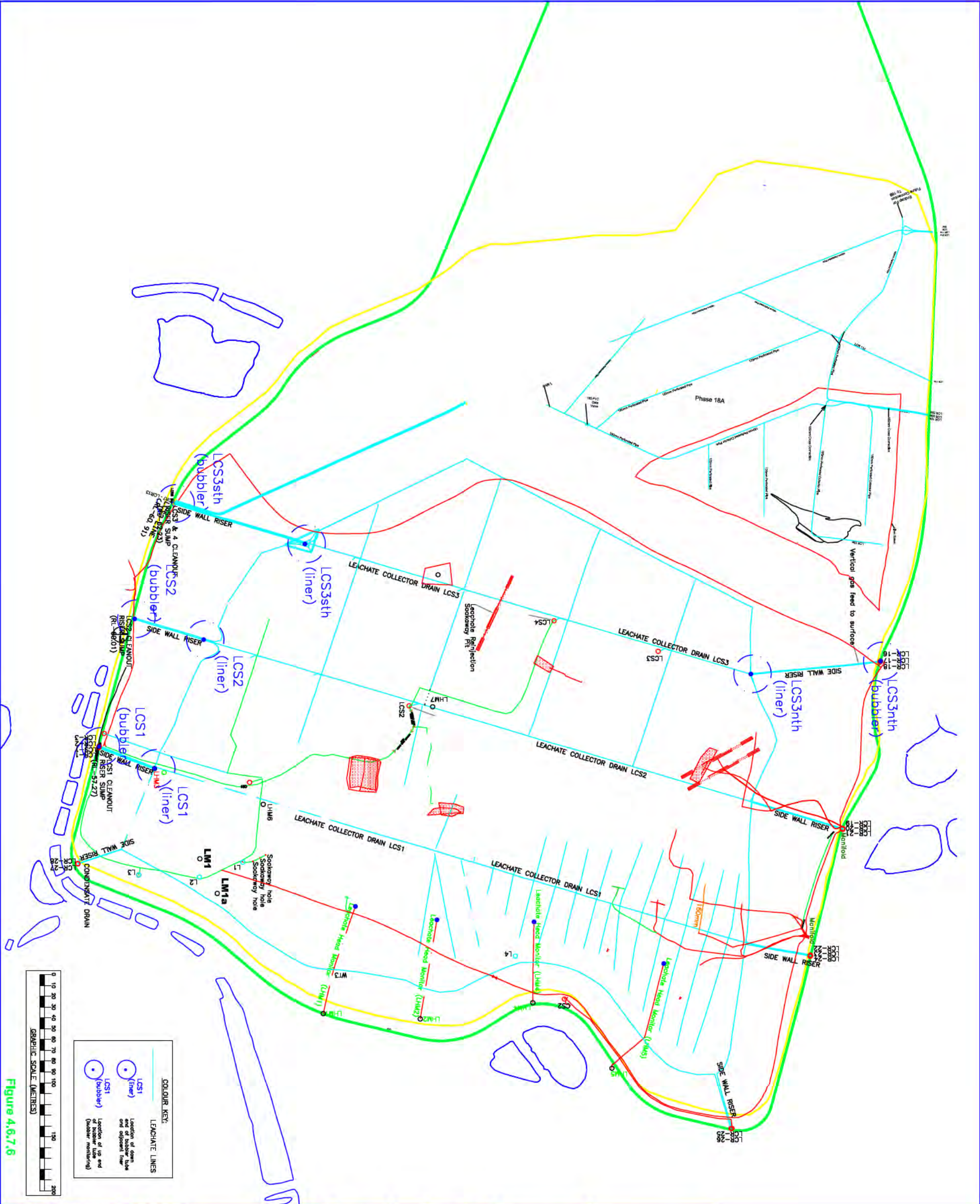
Leachate Management Division

400 S. El Camino Real, Suite 1200, San Mateo, California 94402-1708 • 415/375-1522 • FAX: 415/375-0763

FIGURE:4.6.7.4

Appendix C Leachate head monitoring location plan

DRAFT



Waste Management NZ Ltd
Redvale Landfill
Landfill Access Road
Daily Flat
Auckland 0794
New Zealand
Tel: 09 4270600
Fax: 09 4268284

Scale @ A1: AS-SHOWN
Scale @ A3: AS-SHOWN

G:\CAD\NZ\RED\LEACHATE

Redvale Landfill Leachate Head Monitoring Plan

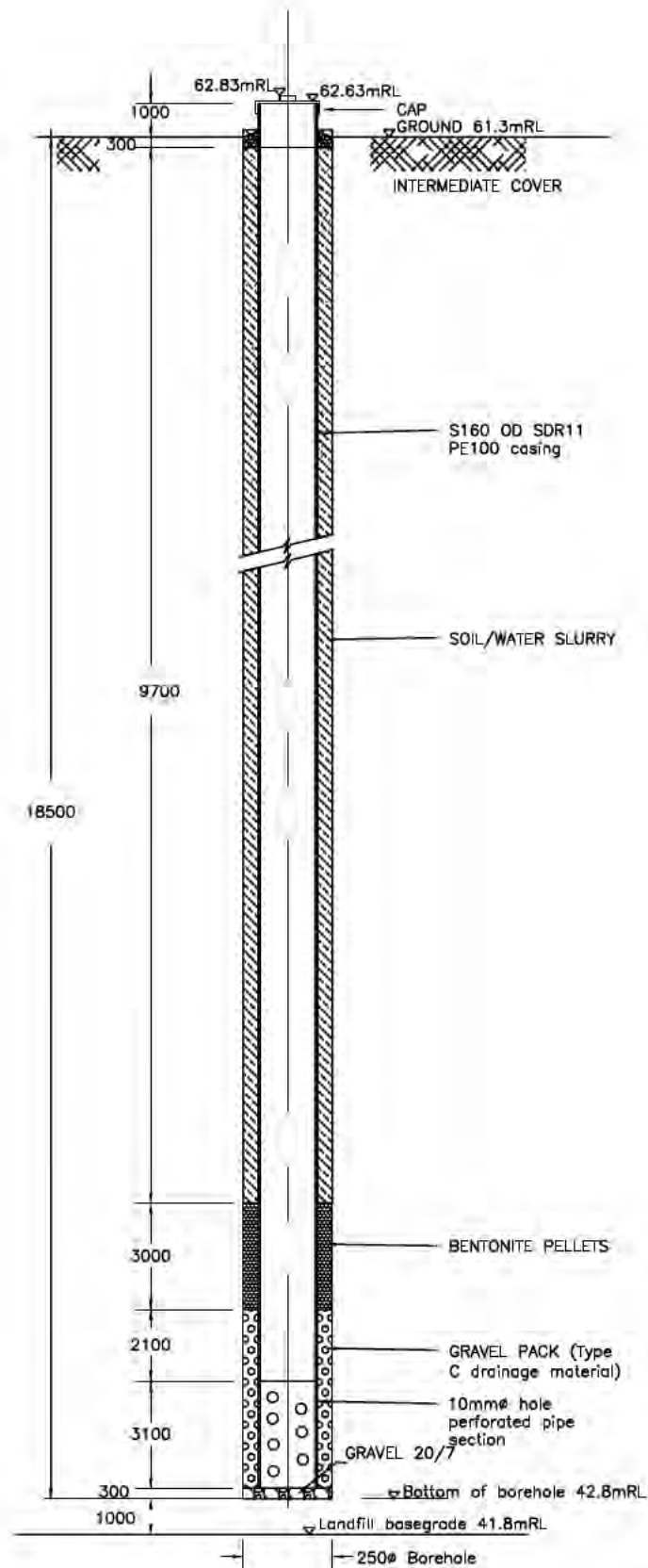
Landfill Management Plan

Name	Date
Submitted:	
Reviewed:	
Drawn:	WIOOBY K 22/4/20
Checked:	DOVO G 22/4/20
Project Manager:	
Site:	
Description:	
Date:	
Approved:	

The Contractor must check & verify all
Dimensions on site before commencement
of Works

Appendix D LM1 as-built drawing

DRAFT



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PERMISSION.

REV.	BY	DATE	DESCRIPTION OF CHANGE
A	WX	16/10/16	ASBUILT

PROJECT TITLE : Redvale Landfill

DRAWING TITLE : Leachate Head Monitoring
LMT

DESIGNER'S REF:

CHECKED: BH 20/10/16

APPROVED:

DRAWN BY: WX 16/10/16

CAD FILE : LM1ASBUILT

SCALE: N.T.S.
PLOT SIZE : A4



SHEET NO : LM1ASBUILT REV: A

Appendix E Parameter list for leachate chemistry monitoring

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LEACHATE ANALYSIS PARAMETER LISTS

Parameter	Unit	Detection limit	Group	List 1 (quarterly)	List 2 (six-monthly)	List 3 (yearly)
Acidity			misc			*
Alkalinity total	g/m3		misc			*
Aluminium total	g/m3	0.01	misc			*
Ammonia total	g/m3 as N	1	misc			*
Antimony	g/m3		misc			*
Arsenic total	g/m3	0.001	misc	*	*	*
Barium	g/m3		misc			*
Beryllium	g/m3		misc			*
Bismuth total	g/m3		misc			*
BOD5	g/m3 O2	1	misc	*	*	*
Boron total	g/m3	0.1	misc	*	*	*
Cadmium total	g/m3	0.0001	misc	*	*	*
Caesium total	g/m3		misc			*
Calcium	g/m3	1	misc			*
Chloride	g/m3	1	misc			*
Chromium total	g/m3	0.001	misc	*	*	*
Cobalt total	g/m3	0.001	misc	*	*	*
COD	g/m3	40	misc	*	*	*
Coliforms	g/m3		misc			*
Conductivity	mS/m 20°C	1	misc	*	*	*
Copper total	g/m3	0.001	misc	*	*	*
Cyanide	g/m3		misc			*
Fluoride	g/m3	0.1	misc			*
Hardness	g/m3 CaCO3	1	misc			*
Iron	g/m3	1	misc			*
Lanthanum total	g/m3		misc			*
Lead total	g/m3	0.01	misc	*	*	*
Lithium total	g/m3		misc			*
Magnesium	g/m3	1	misc			*
Manganese	g/m3	0.01	misc			*
Mercury total	g/m3	0.0001	misc	*	*	*
Molybdenum	g/m3		misc			*
Nickel total	g/m3	0.01	misc	*	*	*
Nitrate	g/m3 as N	0.01	misc			*
pH lab		±0.1	misc	*	*	*
Phos (DRP)	g/m3	0.01	misc			*
Phosphorus total	g/m3	0.01	misc			*
Potassium	g/m3	1	misc			*
Rubidium total	g/m3		misc			*
Selenium	g/m3		misc			*
Silver	g/m3		misc			*
Sodium	g/m3	1	misc			*
Strontium total	g/m3		misc			*
Sulphate	g/m3	1	misc			*
Sulphide total	g/m3	0.02	misc	*	*	*
Sulphur total	g/m3	0.5	misc			*
Suspended solids	g/m3	3	misc			*
TDS	g/m3	3	misc	*	*	*
Temperature	°C		misc			(*)
Thallium	g/m3		misc			*
Tin	g/m3	0.01	misc			*
Uranium total	g/m3		misc			*
Vanadium	g/m3		misc			*
Zinc total	g/m3	0.1	misc	*	*	*
Dioxin			orgs			(*)
Oil & Grease	g/m3		orgs			
OrgCl pestic	mg/m3		orgs			
PCB (polychlorinated biphenyls)	g/m3		orgs		*	*
PCP	mg/m3		orgs			
Phenols	mg/m3		orgs			
Semi volatile organics	mg/m3		orgs		*	*
TBTO (tributyl tin oxide)	g/m3		orgs		*	*
TOC	mg/m3		orgs			
TOX	mg/m3		orgs			
Volatile organics	mg/m3		orgs		*	*
Volatile acids	g/m3		orgs			

Note: No test is required by consent conditions.

* = Likely to be included. (*) = Included less frequently than annually.

Figure 4.6.7.5

Appendix F Contingency plan flowchart

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REDVALE LANDFILL MANAGEMENT PLAN

Contingency Plan Flowchart

Leachate Level in the Landfill

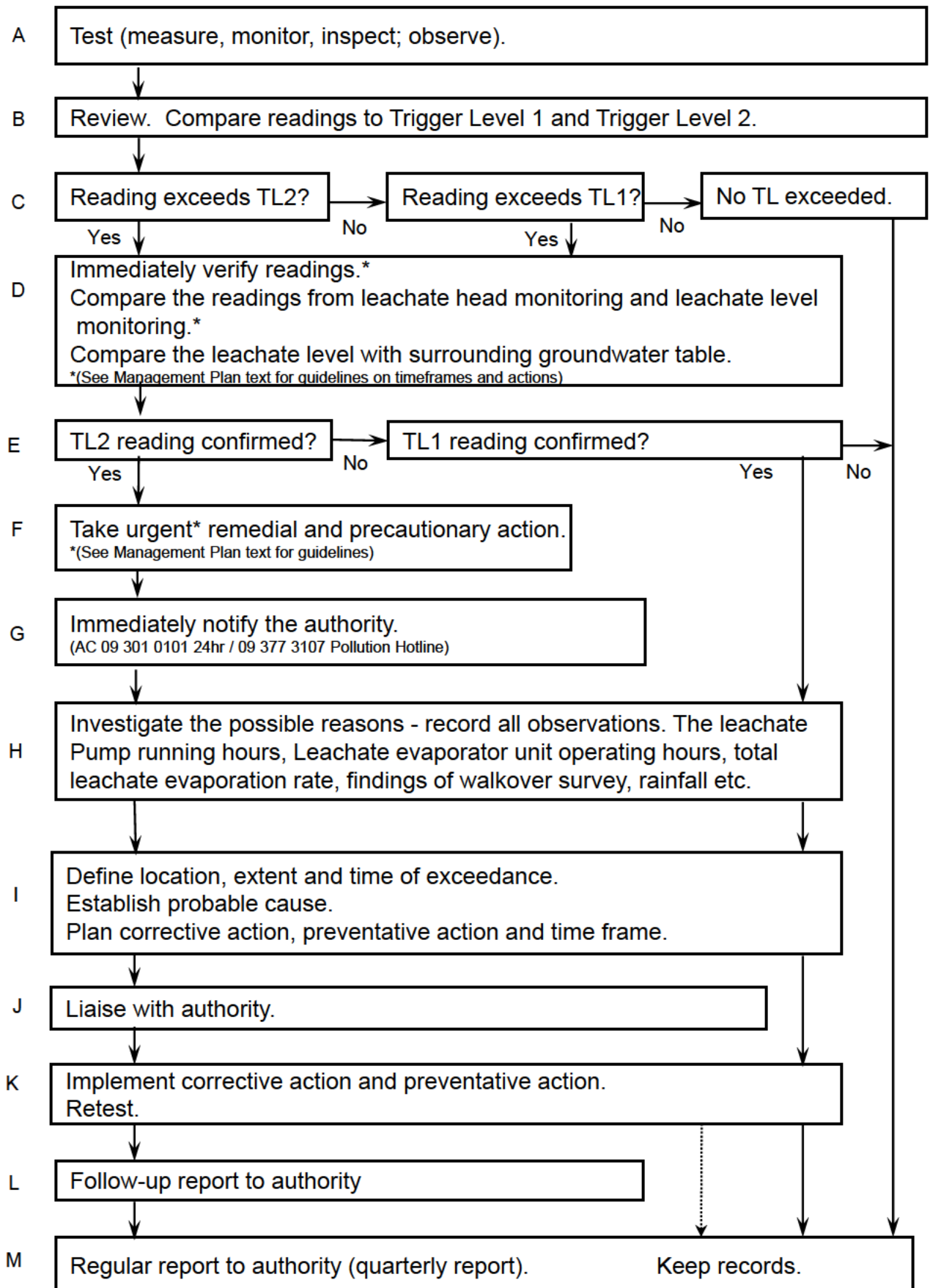


Figure 4.6.7.10